POLARAD

PROVEN RELIABILITY

HANDBOOK
OF
OPERATING INSTRUCTIONS

RETURN TO
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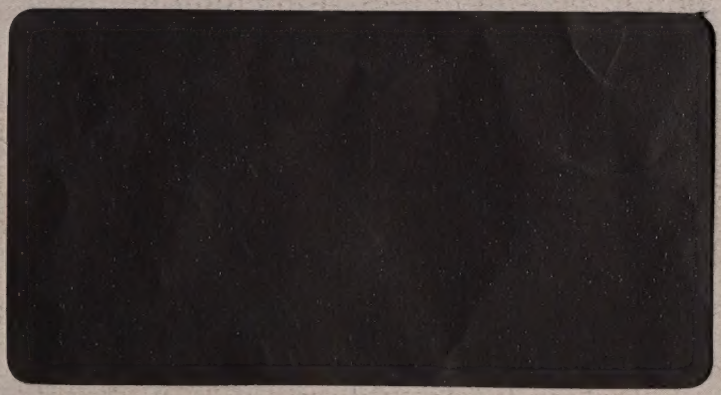

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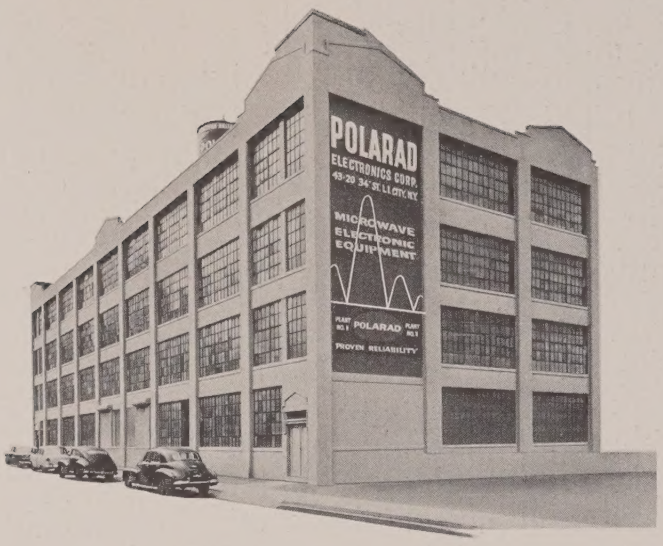

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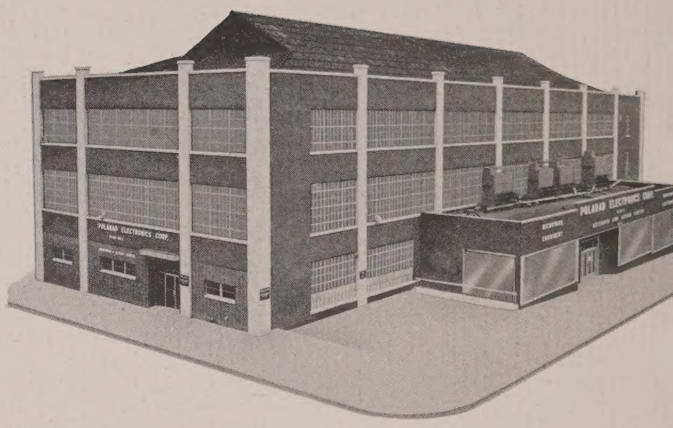

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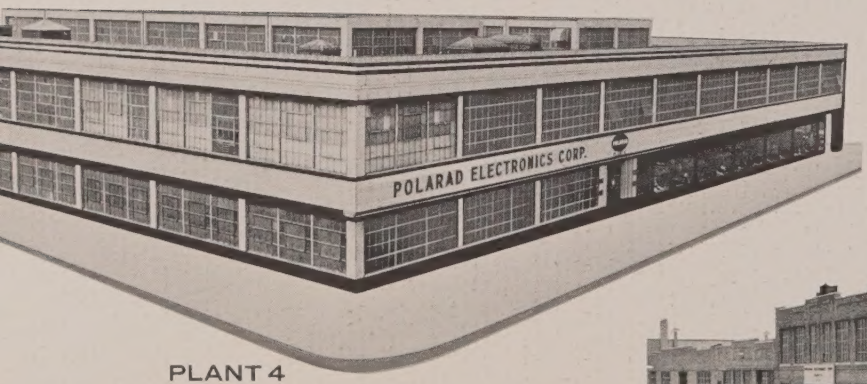

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POLARAD ELECTRONICS CORPORATION 43-20 34th STREET, LONG ISLAND CITY 1, N. Y.

INSTRUCTION MANUAL

RETURN TO
AEROSPACE DIV.

MICROWAVE
SPECTRUM ANALYZER
MODEL TSA-W

RUN NO. 5

POLARAD ELECTRONICS CORPORATION . 43-20 34th St., Long Island City 1, N.Y.

Warranty

Polarad Electronics Corporation warrants each instrument of its manufacture to be free from defects in material and workmanship. Our obligation under this Warranty is limited to servicing or adjusting any instrument returned to our factory for that purpose, and to making good at our factory any part or parts thereof except tubes, fuses or batteries, which shall, within one year after making delivery to the original purchaser, be returned to us with transportation charges prepaid, and which on our examination shall disclose to our satisfaction to have been thus defective.

Polarad Electronics Corporation reserves the right to make changes in design at any time without incurring any obligation to install same on units previously purchased.

This Warranty is expressly in lieu of all other obligations or liabilities on the part of the Polarad Electronics Corporation, and Polarad neither assumes nor authorizes any other person to assume for them any other liability in connection with the Sales of Polarad's instruments.

POLARAD
PROVEN RELIABILITY

SECTION I

INTRODUCTION

1-1. SCOPE OF MANUAL.

1-2. This manual contains instructions for the installation, operation and maintenance of the Polarad Wide Dispersion Spectrum Analyzer, Models TSA-W and TSA-WF. The Models TSA-W and TSA-WF are identical except that the Model TSA-WF is designed to operate at a power line frequency between 50 and 1,000 cps. The Model TSA-W is described in this manual and this information also applies to the TSA-WF unless otherwise noted. The Models TSA-W and TSA-WF are designed and manufactured by Polarad Electronics Corporation, Long Island City 1, New York.

1-3. PURPOSE OF EQUIPMENT.

1-4. The Polarad Wide Dispersion Spectrum Analyzer, Model TSA-W, is a precision instrument for presenting the spectral display of signal energy in the frequency range from 10 to 44,000 mc. The spectral display appears on the screen of a crt with the frequency of the applied signal being displayed on the X axis, while the amplitude of the frequency is displayed on the Y axis. Some specific uses of the Model TSA-W are:

a. Observing and measuring AM and FM signal side bands.

b. Measuring the frequency of radio and/or radar signals.

c. Determining the type of modulation in radio and/or radar signals.

d. Checking the tracking of radar system r-f components.

e. Displaying the power spectrum of r-f pulses.

f. Checking the spectrum of pulsed magnetron oscillators.

g. Measuring noise spectra.

h. Measuring frequency.

i. Checking frequency relationship of multi-frequency transmitters.

j. Measuring parasitic oscillation.

k. Checking transmitters or signal generators for continuous output throughout tuning range.

l. Checking oscillator frequency drift.

m. Locating source of r-f leaks.

1-5. GENERAL DESCRIPTION.

1-6. The Model TSA-W is essentially a superheterodyne receiver using four converters and working into a cathode-ray tube display. It consists of the basic unit Model DU-2A, and one of the five plug-in RF Tuning Units, Models STU-1WA, STU-2WA, STU-3WA, STU-4WA and STU-5WA The tuning units cover a frequency range from 10 to 44,000 mc. The basic unit consists of a wide band i-f amplifier, narrow band i-f amplifier, variable bandwidth i-f amplifier, variable frequency marker oscillator, sweep frequency ganerator, and video chassis. The video chassis contains a logarithmic amplifier, vertical and horizontal amplifiers, blanking and intensifier amplifier, and the phantastron sweep generator. Four electronically regulated power supplies and one unregulated supply provide the necessary operating voltages. Each of the five tuning units contains a local oscillator, a crystal mixer, and a precision UNIDIAL® drive mechanism for simultaneous tracking of the local oscillator with tuning dial rotation. Special shielding is provided to minimize leakage radiation, and to permit satisfactory operation in the presence of high power trans-

mitters. The Model TSA-W is furnished either in a cabinet for bench or cart use, or with brackets for rack mounting.

1-7. EQUIPMENT SUPPLIED.

1-8. Table 1-1 lists the equipment supplied which comprises the Model TSA-W. Optional accessories are listed in table 1-2.

TABLE 1-1. EQUIPMENT SUPPLIED

Component	Polarad Model or Part No.	Figure 1-1 Index No.	Over-all Dimensions (inches) (Unless otherwise indicated) HXWXD	Weight (lbs.)
RF Tuning Unit	STU-1WA, STU-2WA, STU-3WA, STU-4WA, or STU-5WA	1		
Model TSA-W Basic Unit	DU-2A	2	20⅝x18-3/4x25-3/4	135
I-F Cable Assembly W80	A135336	3	4 in. long	
AC Power Cord W71 with Adapter CP1	B111144 A131966	4	10 ft. long	1.06
Amber CRT Filter H1	B27336-1	5		0.25
Wrench Kit	A25109	6		0.75
R-F Cable Assembly W72	BP12551	7	6 ft. long	0.75
Plastic Bag			16 x 12-1/2	
Instruction Manual				
Handbook of Spectrum Analyzer Techniques				

TABLE 1-2. OPTIONAL ACCESSORIES

Name	Function
RF Tuning Unit, Models STU-1WA, STU-2WA, STU-3WA, STU-4WA, and STU-5WA.	Additional tuning units increase the frequency range of the basic TSA-W Spectrum Analyzer
RF Tuning Dust Cover.	Used to store tuning units when they are not installed in basic unit Model DU-2A
Model DA-4 Instrument Dolly.	Conserves bench space and makes cabinet mounted unit more portable.
Model SB-2 Brackets.	For rack mounting unit with panel flush with rack.
Model SB-3 Brackets.	For rack mounting unit with panel protruding from rack.

1-9. TECHNICAL CHARACTERISTICS.

1-10. The technical characteristics of the Model TSA-W are listed below. Unless otherwise stated all values are nominal.

DISPLAY AND POWER SUPPLY UNIT MODEL DU-2A:

Shielding attenuation ..... Greater than 100 db.

Spectral display..... Signal amplitude on vertical axis (log or linear), versus frequency on horizontal axis.

Logarithmic display..... 3 db per graticule division to 24 db.

Variable bandwidth..... 1 kc to 80 kc, continuously variable.

Sweep Frequency Rate..... 1 to 30 cps, adjustable.

Frequency dispersion:

Below 55 mc	60 kc to 5 mc.
55 mc to 1,000 mc	60 kc to 25 mc.
1,000 to 44,000 mc	60 kc to 80 mc in two bands: 60 kc to 10 mc and 1 mc to 80 mc.
I-F Attenuation range	0 to 40 db, continuously variable.
Internal marker.....	Variable marker calibration ±40 mc in frequency difference from 160 mc adjustable amplitude.
Synchronization.....	External, free-running or line frequency.
Maximum power input.....	250 milliwatts.
CRT display tube.....	5 inch flat face with edge lighting on graticule, and camera mounting facilities on CRT bezel.

Power requirements

Model TSA-W.....	115/230 vac ±10% 50/60 cps, 500 watts
Model TSA-WF.....	115/230 vac ±10% 50 cps to 1,000 cps, 500 watts.

RF TUNING UNITS

Model	Frequency Range (mc)	Sensitivity* (-dbm)	RF Attenuator Range
STU-1WA	10 to 400	90 to 100	0 to 100 db
	350 to 1,000	90 to 95	0 to 100 db
STU-2WA	910 to 2,200	85 to 95	0 to 100 db
	1,980 to 4,560	75 to 87	0 to 100 db
STU-3WA	4,370 to 11,000	77 to 90	0 to 100 db
	8,900 to 22,000	65 to 85	below 12 kmc
STU-4WA	21,000 to 33,000	57 to 75	external attenuator
STU-5WA	33,000 to 44,000	50 to 65	external attenuator

*Sensitivity is minimum discernible signal.

Frequency dial accuracy..... ±1% of dial readings except for Model STU-1WA which is ±1% of local oscillator frequency.

1-11. ELECTRON TUBE, SEMICONDUCTOR AND FUSE COMPLEMENTS.

1-12. Tables 1-3, 1-4 and 1-5 list the electron tube, semiconductor and fuse complements respectively.

TABLE 1-3. ELECTRON TUBE COMPLEMENT

Model DU-2A Display Chassis	
Quantity	Type No.
5	0A2
2	1Z2
1	5ADP7
2	5R4
1	6AG5
2	6AK5
2	6AN8
1	6AR6
1	6005
1	6AS6
2	6BE6
2	12AT7
3	12AU7
4	12AX7
2	807
1	5651

TABLE 1-3. ELECTRON TUBE COMPLEMENT (Cont'd)

Model DU-2A Display Chassis (Cont'd)	
Quantity	Type No.
4	5718
1	5881
3	6080
4	6922
4	6AH6

TUNING UNITS

Quantity	Type No.	Tuning Unit Model No.
1	6AF4A	STU-1WA
1	ZV1009 or 6BM6 or 5837	STU-2WA
1	6X4	STU-2WA
1	5721	STU-3WA
1	6X4	STU-3WA
1	5721	STU-4WA
1	6X4	STU-4WA
1	5721	STU-5WA
1	6X4	STU-5WA

TABLE 1-4. SEMICONDUCTOR COMPLEMENT

Model DU-2A Display Chassis	
Quantity	Polarad Drawing or Type No.
2	1N69
1	1N82A
7	1N198
2	40K
1	2N277
1	1N2970A
1	1N1341
1	A27794
12	B707117

TUNING UNITS

Quantity	Type No.	Tuning Unit Model No.
1	PADT30	STU-1WA
1	1N21C	STU-1WA
1	1N21B or 1N23C	STU-2WA
1	1N26 or 1N78	STU-3WA
1	1N26	STU-4WA
1	1N53	STU-5WA

TABLE 1-5. FUSE COMPLEMENT

Quantity	Type	Rating
1	MDL 4	4A, 250V
1	MS90078-11	2A, 250V
2	MDL-6.25 Bussman	6.25A

SECTION II

OPERATION

2-1. INSPECTION.

2-2. Before installing or operating the Model TSA-W inspect it for damage that might have occurred in shipment. Check the equipment for completeness by refering to table 1-1 for the items supplied, and to table 1-2 for the optional accessories ordered. After the equipment has been checked for completeness, inspect it as follows:

a. Examine exterior surface for dents or scratches.

b. Examine handles, latches, and fasteners for tightness and ease of operation.

c. Operate control knobs, which should turn freely, index at panel markings, and be tight on their shafts.

d. Examine dials and indicators for legibility.

e. Operate switches, which should set readily.

f. Examine electron tubes for proper seating, and presence of shields of clamps.

2-3. EQUIPMENT INSTALLATION.

2-4. After inspecting the equipment plan its installation. The Model TSA-W is supplied mounted in a cabinet for bench or cart use, or ready for one of two types of rack mounting. Figure 2-1 illustrates the Model TSA-W installed in a cabinet, while figures 2-2 and 2-3 are installation outline drawings for a rack mounted unit with the panel protruding and a rack mounted unit with the panel flush. When the Model TSA-W is to be used mounted in a cabinet, consider the use of instrument Dolly DA-4 for conserving

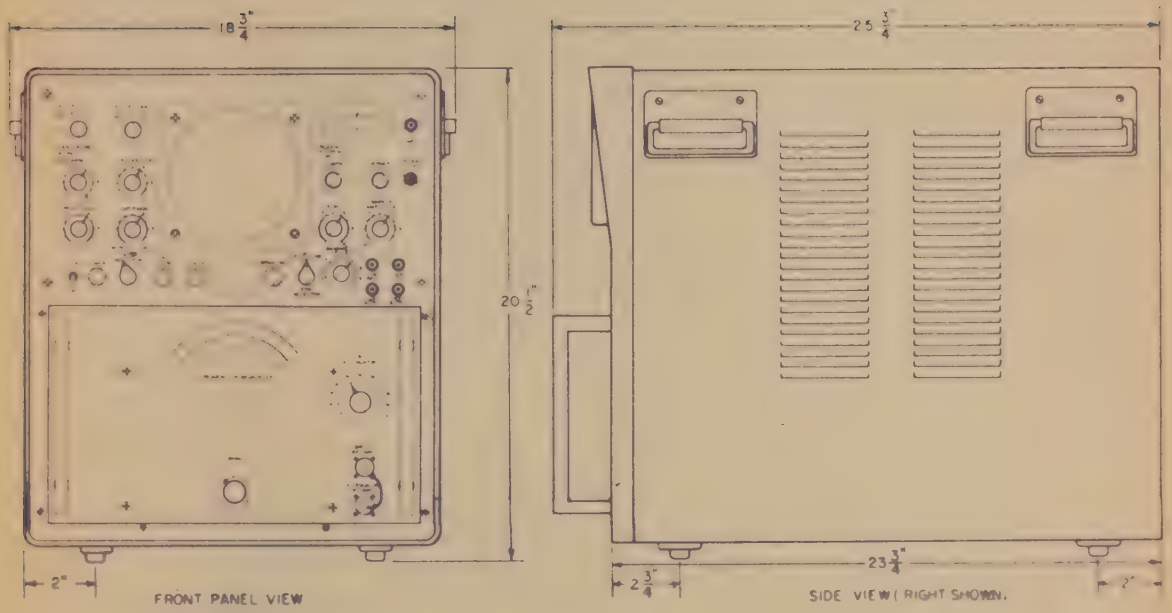


Figure 2-1. INSTALLATION OUTLINE DRAWING, CABINET MOUNTED UNIT.

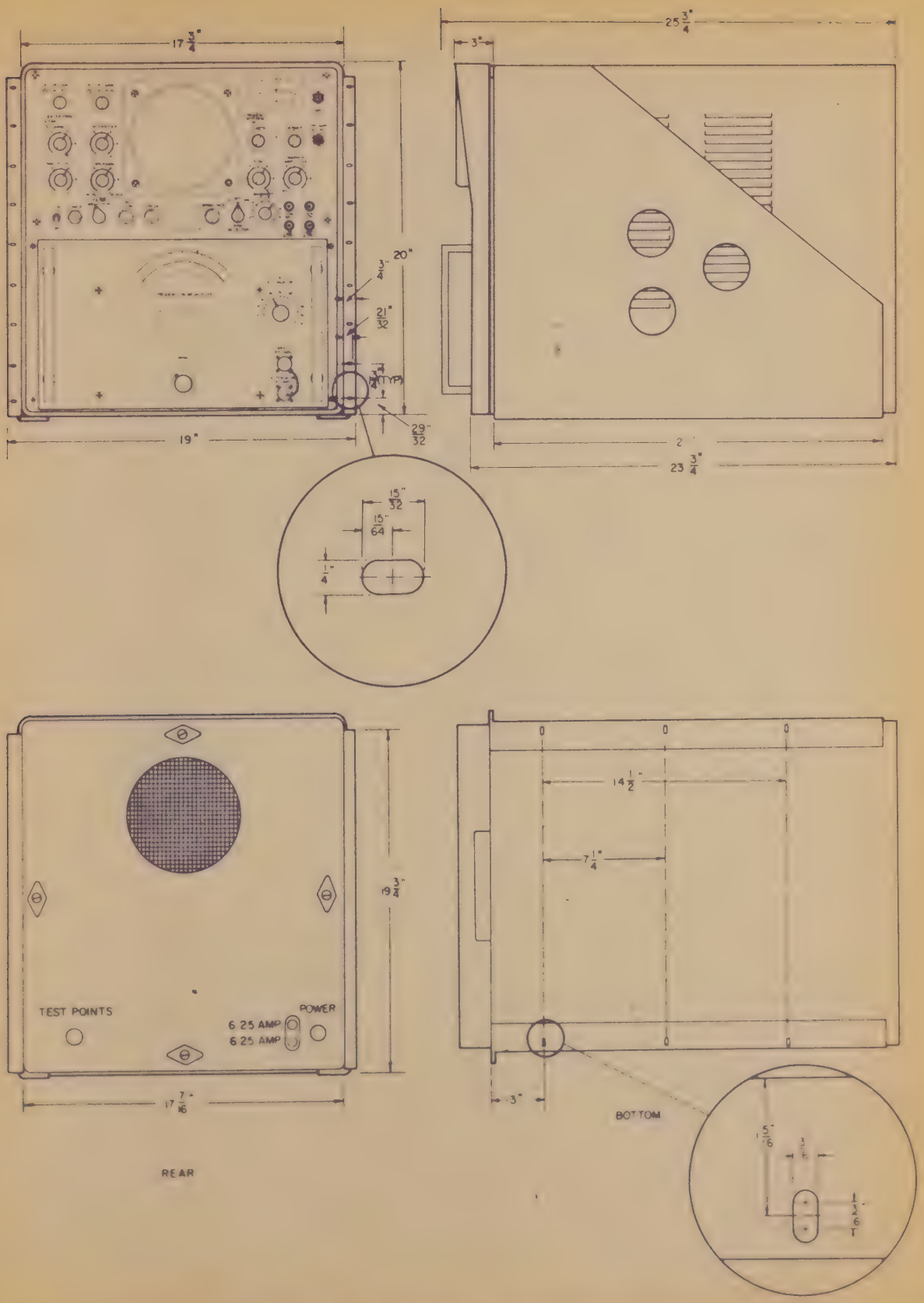


Figure 2-2. INSTALLATION OUTLINE FRAWING, PROTRUDING-PANEL RACK MOUNTED UNIT.

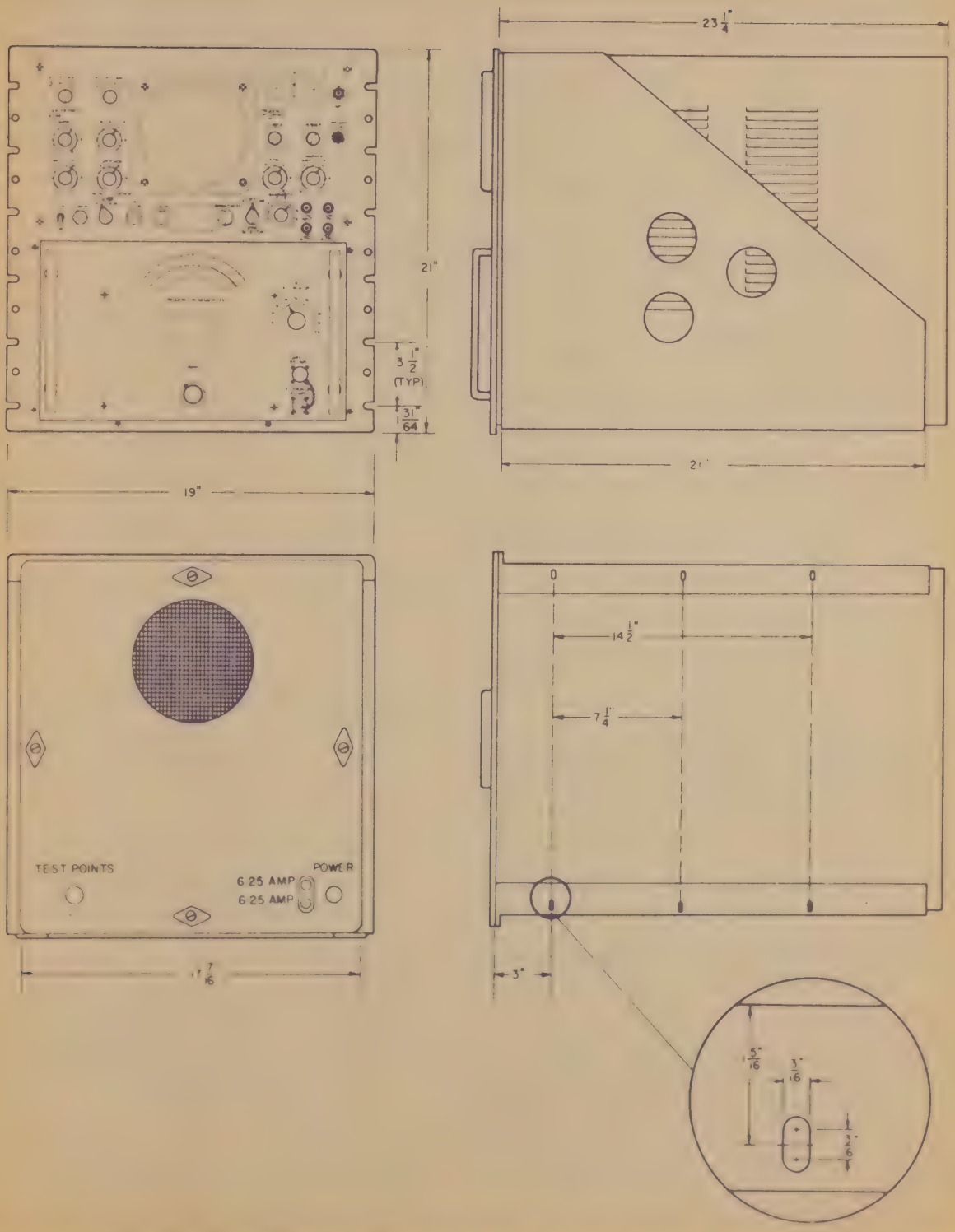


Figure 2-3. INSTALLATION OUTLINE DRAWING, FLUSH-PANEL RACK MOUNTED UNIT.

bench space. If either of the rack mountings is to be used, select a position in the rack that will provide maximum accessibility and adequate ventilation.

2-5. CONTROLS, INDICATORS AND CONNECTORS.

2-6. The operating controls, indicators and connectors of Model TSA-W are listed in table 2-1 and shown in figure 2-4.

TABLE 2-1. OPERATING CONTROLS, INDICATORS AND CONNECTORS

Front Panel Designation	Figure 2-4 Index No.	Function
Power ON-OFF switch and POWER pilot lamp	1	Energizes the TSA-W and indicates that the TSA-W is energized.
FOCUS control	2	Adjusts the sharpness of the CRT display.
SWEEP SPEED control	3	Permits control of the sweep repetition rate, which can be varied from 1 to 30 cps.
CENTER FREQUENCY COARSE-FINE control	4	Permits adjustment of the center frequency of the sweep-frequency generator to position the display at the electrical center of the crt.
DISPERSION HIGH-LOW switch and DISPERSION control	5	The switch selects the dispersion range: LOW - 60 kc to 10 mc HIGH - 1 mc to 80 mc. The control varies the dispersion within the range selected.
HOR GAIN and HOR POS controls	6	Permits the varying of the width of the horizontal display on the crt. Permits the display on the crt to be shifted either to the left or to the right.

TABLE 2-1. OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont'd)

Front Panel Designation	Figure 2-4 Index No.	Function
INTENSIFIER control	7	Permits the adjustment of the intensity of only the signal portion of the display which is passed by the video amplifier.
VERT GAIN and VERT POS controls	8	POS control permits the display on the crt to be shifted either up or down. GAIN control permits the adjustment of the height of the vertical display on the crt.
BRIGHTNESS control	9	Varies the brightness of the trace on the crt.
SYNC control	10	Permits the adjustment of the synchronizing voltage, permitting the phantastron generator to lock at sub-multiples of the line frequency.
FREQUENCY DIFFERENCE MC dial and COARSE and VERNIER controls	11	Rotation of the COARSE and VERNIER controls permits the location of the marker pip within ±40 mc of the i-f bandpass center frequency. Variation from the i-f bandpass center frequency is indicated on the FREQUENCY DIFFERENCE MC dial.
I-F INPUT jack	12	Provided for applying either the output of the tuning unit or an external test signal to the display unit circuitry.
PREAMP OUTPUT jack	13	Provided for access to the output of the tuning unit. It also permits the use of the Polarad Model SD-1 Multipulse Spectrum Selector, which makes it possible for the TSA-W to analyze individual pulses in a pulse group.

TABLE 2-1. OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont'd)

Front Panel Designation	Figure 2-4 Index No.	Function
MARKER AMPLITUDE control	14	This control, when rotated clockwise beyond its OFF position, permits the adjustment of the height of the marker pip on the crt.
BANDWIDTH control	15	Permits the varying of the resolution bandwidth from 1 to 80 kc.
SYNC INPUT jack	16	Provided for the application of an external synchronizing signal (with the SYNC SELECTOR switch in the EXT position) to the phantastron generator.
HOR OUTPUT jack	17	Provides output for external use of the horizontal sawtooth voltage.
VIDEO OUTPUT jack	18	Provides output for remote viewing of the video signal.
LOG OUTPUT jack	19	Provides output for external use of a logarithmic signal.
SYNC SELECTOR switch	20	Permits the selection of either internal or external synchronization of the phantastron generator. When in the OFF position, the phantastron generator is free-running.
RF ATTENUATOR control	21	Permits the attenuation of the incoming rf signals which are applied to the ATTENUATOR RF INPUT jack. The attenuation inserted by this control is variable between 0 and 100 db for use up to 12.4 KMC.

TABLE 2-1. OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont'd)

Front Panel Designation	Figure 2-4 Index No.	Function
DIRECT RF INPUT jack	22	Provided for the direct application of incoming RF signals. This connection utilizes the maximum sensitivity of the TSA-W
ATTENUATOR RF INPUT jack	23	Provided for the connection of the incoming rf signals to the RF ATTENUATOR, for use up to 12.4 KMC.
TUNING control	24	Adjusts the frequency of the signal displayed on the crt.
SCALE ILLUM control	25	Controls the illumination of the crt graticule.
LOG-FILTER-LIN switch	26	Permits the selection of logarithmic, logarithmic-filter, linear-filter or linear vertical deflection on the cathode-ray tube. The filter positions introduce a video filter in the circuitry.

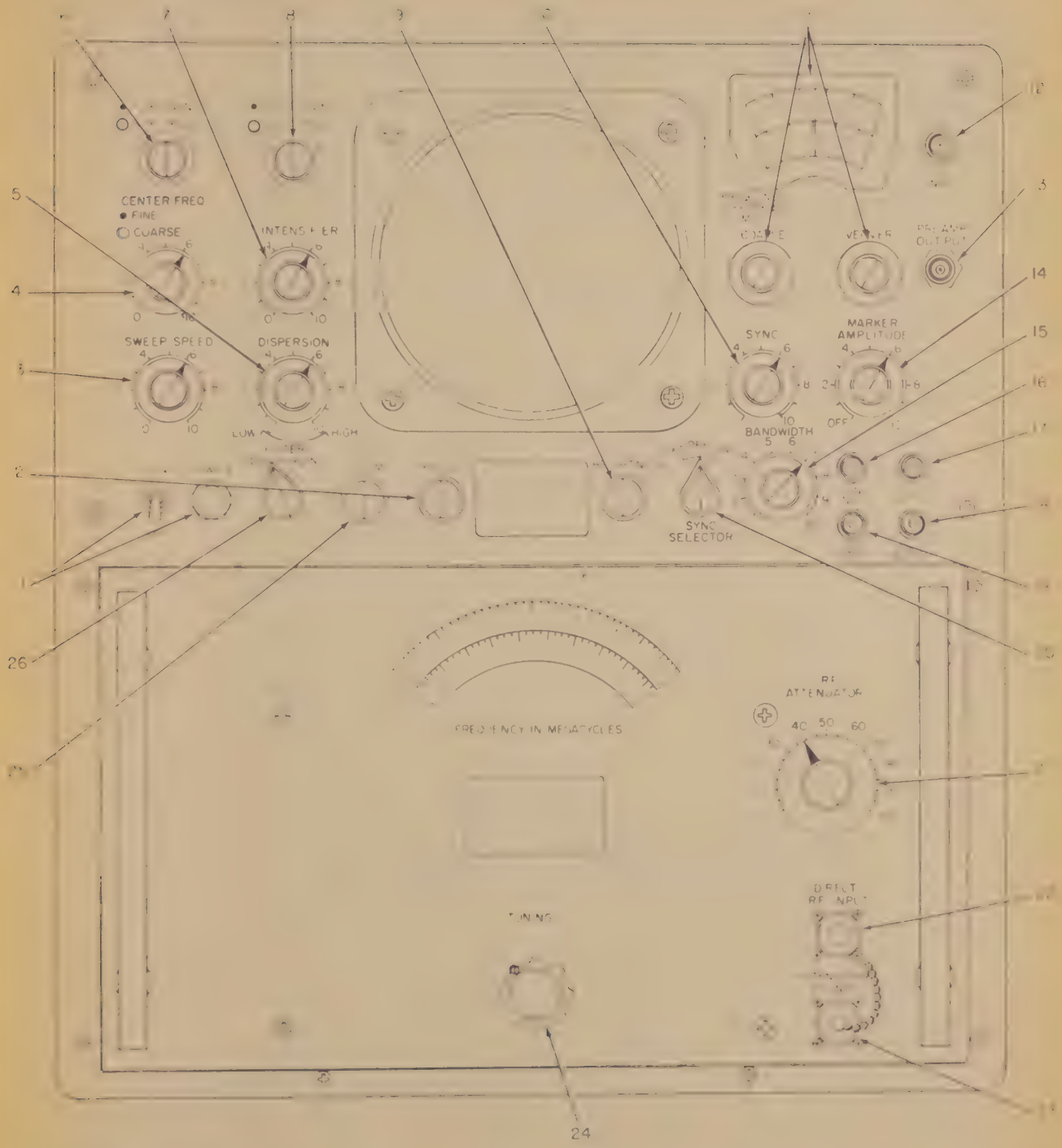


Figure 2-4. OPERATING CONTROLS, INDICATORS AND CONNECTORS.

2-7. STARTING PROCEDURE.

(See figure 2-4)

2-8. Before applying power to the Model TSA-W, the position of the line-voltage selector switch, located at the rear of the display chassis, must be checked (see figure 4-4). This requires that the chassis be removed from the cabinet. To do this, proceed as follows:

a. Set the Model TSA-W on a bench so that the rear of the cabinet is accessible.

b. Turn the four cam-lock screws located on the rear of the cabinet in a clockwise direction until they are loose.

c. Slide the display chassis out of the cabinet.

d. Set the line-voltage selector switch to the position desired for either 115-volt or 230-volt operation.

e. Slide the display chassis back into the cabinet.

f. Turn the four cam-lock screws in a clockwise direction until the chassis is locked in place.

CAUTION

USE CARE WHEN REMOVING AND REPLACING THE INSTRUMENT. DO NOT USE FORCE TO GET IT INTO OR OUT OF THE CABINET.

2-9. PRELIMINARY OPERATING PROCEDURE.

(See figure 2-4)

2-10. The Model TSA-W is factory adjusted for proper alignment and operation before shipment. No internal controls need be adjusted during normal operation of the equipment. Before operating the TSA-W, perform the operating checks indicated in the following steps.

a. Connect a nominal 115/230 volt, 50 to 60 cps power source (50 to 1000 cps for the TSA-WF) to the power input receptacle J127 (located at the bottom rear of the Display Unit) via Electrical Power Cable Assembly W71 and Power Cable Adapter CP1.

CAUTION

THE 115/230 VOLT SWITCH (LOCATED AT THE BOTTOM REAR OF THE DISPLAY UNIT) IS FACTORY SET TO THE 115 VOLT POSITION. IF THE TSA-W IS TO BE OPERATED FROM A 230 VOLT LINE, BE SURE TO SET THE 115/230 VOLT SWITCH TO THE 230 VOLT POSITION.

WARNING

APPLICATION OF POWER TO THIS EQUIPMENT RESULTS IN VERY HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OBSERVE ALL SAFETY PRECAUTIONS AT ALL TIMES.

b. Turn the power ON-OFF switch to the ON position. The POWER pilot lamp will become illuminated, indicating that line power is being applied to the primaries of the power transformers in the low-voltage power supply.

c. Allow a fifteen-minute warm-up period for the local oscillator (located in the Tuning Unit) to stabilize.

d. Connect I-F Cable Assembly W80 as a jumper between the PREAMP OUTPUT jack and the I-F INPUT jack.

e. Adjust the HOR GAIN, HOR POS, FOCUS and BRIGHTNESS controls to obtain a sharp base line on the crt screen.

f. Adjust the VERT POS control to locate the base line on the crt screen directly below the lowest horizontal line etched on the crt graticule.

g. Set the DISPERSION switch to the HIGH position.

h. Rotate the DISPERSION control fully clockwise.

i. Set LOG-FILTER-LIN switch in LIN position.

j. Rotate BANDWIDTH control maximum clockwise.

k. Rotate the VERT GAIN control fully clockwise.

l. Rotate the MARKER AMPLITUDE control fully clockwise.

m. Rotate the COARSE and VERNIER controls to line up the FREQUENCY DIFFERENCE MC dial 0 marks directly below the index hair-line. This operation places the marker pip at the electrical center of the display.

n. Rotate the CENTER FREQUENCY cont ols to position the marker pip at the physical center of the crt display.

o. Set the SYNC SELECTOR switch in the OFF position.

p. Set the SWEEP SPEED control to 8.

q. Rotate the MARKER AMPLITUDE control to set the height of the marker pip at approximately three inches.

r. Check that the proper tuning unit forthe frequency range to be covered has been installed.

s. Rotate the TUNING control to position the index at the low end of the FREQUENCY IN MEGACYCLES dial.

t. Connect the output jack of a microwave signal generator, with appropriate range for the particular tuning head, to the DIRECT RF INPUT jack via RF Cable Assembly W72 for a CW output of less than -20 dbm. If the output is greater than -20 dbm, the signal source should be connected to the ATTENUATOR RF INPUT. When this is done while using Tuning Units STU-1WA and STU-3WA, it is necessary to connect the ATTENUATOR OUTPUT to the DIRECT RF INPUT by means of the patch cable supplied with the unit.

u. Rotate the TUNING control until a pip representing the incoming r-f signal appears on the crt screen. The signal will enter the display from the right. If the display is excessively large, vary the VERT GAIN control to set the height of the pip at a convenient level.

v. Continue rotating the TUNING control until the pip representing the incoming r-f signal coincides with the MARKER pip.

w. The frequency of the unknown signal is then read directly from the FREQUENCY IN MEGACYCLES dial. However, when Tuning Units STU-1WA, STU-2WA or STU-3WA is being used, it is necessary to determine which of the two frequency bands marked on the dial is to be read. To determine which of the two frequency bands is to be read, proceed as follows:

(1) Align the true signal display with the marker pip.

(2) Set the FREQUENCY DIFFERENCE MC dial to read 40 mc. This will move the marker pip 40 mc away from the display signal.

(3) Note the readings of the bands marked on the FREQUENCY IN MEGACYCLES dial.

(4) Adjust the TUNING control until the signal display is aligned with the marker pip.

(5) Again note the readings of the bands marked on the FREQUENCY IN MEGACYCLES dial. The band on which the frequency reading has changed by 40 mc from the reading obtained in step (3) is the one that will be used to read the frequency of the unknown signal.

x. Set the FREQUENCY DIFFERENCE MC dial to zero and align the signal display with the marker pip. Read the frequency of the unknown signal from the FREQUENCY IN MEGACYCLES dial using the band noted in step w(5).

2-11. MEASUREMENT OF RELATIVE R-F POWER.

2-12. Assume that two signal pips appear on the crt display, separated by not more than 80 mc. In this example, the larger signal pip is termed "A" and the smaller "B".

a. LOG-FILTER-LIN switch in LIN position.

(1) Observe the position of the smaller signal, pip B. Mark its location on the crt graticule and note its height. For example, pip B reaches a height of 1 cm.

(2) Rotate the TUNING control to position the second signal, pip A, to the mark that located pip B. Note the height of pip A. For example, pip A reaches a height of 3.5 cm.

(3) Refer to the voltage ratio to decibels conversion table (table 2-2), which shows that, for a voltage ratio of 3.5 to 1, signal pip A is approximately 10.9 db greater than signal pip B. The relative difference, in db, of the two signals can also be found by use of the following formula:

$$\text{Relative difference (in db)} = 20 \log_{10} \frac{\text{Height of signal pip A}}{\text{Height of signal pip B}}$$

$$= 20 \log_{10} \frac{3.5 \text{ cm}}{1 \text{ cm}} = 20 \log_{10} 3.5$$

$$= 20 \times 0.544 = 10.88$$

b. LOG-FILTER-LIN switch in LOG position.

(1) Observe the position of the smaller signal, pip B. Mark its location on the crt graticule and note its height.

(2) Rotate the TUNING control to position the second signal, pip A, to the mark that located pip B. Note the height of pip A.

(3) The difference in height between pips A and B, in graticule divisions, multiplied by 3, is the relative difference of signal amplitude, in db.

2-13. USING THE VOLTAGE RATIO TO DB CONVERSION TABLE.

a. Convert the ratio of signal heights to a number consisting of units, tenths, and hundredths.

b. Locate the number obtained in step a above, (or the number closest to it), in the body of table 2-2.

c. Read the db value of the signal height ratio in the following manner:

(1) Note the whole number appearing in the +DB (if the signal height ratio is greater than one) or -DB (if the signal height ratio is less than one) column found at the left or right, respectively, of table 2-2, corresponding to the row in which the ratio appears.

(2) Note the decimal portion appearing at the head of table 2-2 which corresponds to the column in which the voltage ratio appears.

(3) Add the two values obtained in steps 1 and 2, above. This is the db ratio of the signal amplitudes.

Example: If the signal height ratio is 3.5, locate the value 3.51 (the number closest to 3.5) in the main body of the table. The number in the +DB column corresponding to this is 10. Next, locate the decimal portion by locating the head of the column in which the ratio appears, or 0.9. Adding these two numbers, the db ratio of +10.9 is obtained.

TABLE 2-2. RELATION OF VOLTAGE RATIO TO DB.*

+DB	0.0	0.0	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	-DB
0....	1.00	1.01	1.02	1.04	1.05	1.06	1.07	1.08	1.10	1.11	
	1.00	.990	.977	.966	.955	.944	.933	.921	.912	.902...	0
1....	1.12	1.14	1.15	1.16	1.18	1.19	1.20	1.22	1.23	1.25	
	.891	.881	.871	.861	.851	.841	.832	.822	.813	.804...	1
2....	1.26	1.27	1.29	1.30	1.32	1.33	1.35	1.37	1.38	1.40	
	.794	.785	.776	.767	.759	.750	.741	.733	.724	.716...	2
3....	1.41	1.43	1.45	1.46	1.48	1.50	1.51	1.53	1.55	1.57	
	.708	.700	.692	.684	.676	.668	.661	.653	.646	.638...	3
4....	1.58	1.60	1.62	1.64	1.66	1.68	1.70	1.72	1.74	1.76	
	.631	.624	.617	.610	.603	.596	.589	.582	.575	.569...	4
5....	1.78	1.80	1.82	1.84	1.86	1.88	1.91	1.93	1.95	1.97	
	.562	.556	.550	.543	.537	.531	.525	.519	.513	.507...	5
6....	2.00	2.02	2.04	2.07	2.09	2.11	2.14	2.16	2.19	2.21	
	.501	.495	.490	.484	.479	.473	.468	.462	.457	.452...	6
7....	2.24	2.26	2.29	2.32	2.34	2.37	2.40	2.43	2.46	2.48	
	.447	.442	.437	.432	.427	.422	.417	.412	.407	.403...	7
8....	2.51	2.54	2.57	2.60	2.63	2.66	2.69	2.72	2.75	2.79	
	.398	.394	.389	.385	.380	.376	.372	.367	.363	.359...	8
9....	2.82	2.85	2.88	2.92	2.95	2.99	3.02	3.05	3.09	3.13	
	.355	.351	.347	.343	.339	.335	.331	.327	.324	.320...	9
10....	3.16	3.20	3.24	3.27	3.31	3.35	3.39	3.43	3.47	3.51	
	.316	.313	.309	.306	.302	.298	.295	.292	.288	.285...	10
11....	3.55	3.59	3.63	3.67	3.72	3.76	3.80	3.85	3.89	3.94	
	.282	.279	.275	.272	.269	.266	.263	.260	.257	.254...	11
12....	3.98	4.03	4.07	4.12	4.17	4.22	4.27	4.32	4.37	4.42	
	.251	.248	.245	.243	.240	.237	.234	.232	.229	.226...	12
13....	4.47	4.52	4.57	4.62	4.68	4.73	4.79	4.84	4.90	4.95	
	.224	.221	.219	.216	.214	.211	.209	.207	.204	.202...	13
14....	5.01	5.07	5.13	.19	5.25	5.31	5.37	5.43	5.50	5.56	
	.200	.197	.195	.193	.191	.188	.186	.184	.182	.180...	14
15....	5.62	5.69	5.75	5.82	5.89	5.96	6.03	6.10	6.17	6.24	
	1.78	.176	.174	.172	.170	.168	.166	.164	.162	.160...	15
16....	6.31	6.38	6.46	6.53	6.61	6.68	6.76	6.84	6.92	7.00	
	.158	.157	.155	.153	.151	.150	.148	.146	.145	.143...	16
17....	7.08	7.16	7.24	7.32	7.41	7.50	7.58	7.67	7.76	7.85	
	.141	.140	.138	.136	.135	.133	.132	.130	.129	.127...	17
18....	7.94	8.04	8.13	8.22	8.32	8.41	8.51	8.61	8.71	8.80	
	.126	.124	.123	.122	.120	.119	.117	.116	.115	.114...	18
19....	8.91	9.02	9.12	9.23	9.33	9.44	9.55	9.66	9.77	9.89	
	.112	.111	.110	.108	.107	.106	.105	.104	.102	.101...	19
20....	10.0										
	.100										20

*Refer to Page 2-15 for an explanation of the use of the above table.

2-14. MEASUREMENT OF ABSOLUTE POWER.

2-15. To determine the absolute power level of a signal that is under observation, proceed as outlined in paragraph 2-12. Then proceed as directed in the following steps:

a. Rotate the FREQUENCY DIFFERENCE MCS control to position the marker pip beside the pip representing the incoming r-f signal.

b. If the pip representing the incoming signal fluctuates in amplitude, adjust the MARKER AMPLITIDE control so that the marker pip height corresponds to the maximum amplitude of the signal pip.

c. Remove the incoming r-f signal from the TSA-W input jack.

NOTE

Be careful to avoid disturbing the settings of all the controls on the front panel of the TSA-W.

d. Apply the same type of signal from a calibrated signal generator to the same input jack. Tune the generator to position the pip representing its output signal where the unknown signal was, (beside the marker pip).

e. Adjust the power level control of the signal generator to obtain a signal pip which has the same height as the marker pip appearing on the crt screen. The absolute power level of the signal being analyzed may now be determined by reading the power setting of the signal generator.

NOTE

If the original signal under observation was applied to the TSA-W through an attenuator (either internal or external), the amount of attenuation must be taken into account and added to the reading of the signal generator power setting.

2-16. DETERMINING THE WIDTH OF ANY LOBE OF A SIGNAL SPECTRUM.

2-17. To determine the width of any lobe of a signal spectrum, proceed as outlined below:

a. Connect operating power to the TSA-W.

b. Connect I-F Cable Assembly W80 as a jumper between the PREAMP OUTPUT jack and the I-F INPUT jack.

c. Adjust the HOR GAIN, HOR POS, FOCUS, and BRIGHTNESS controls to obtain a sharp base line on the crt screen.

d. Adjust the VERT POS control to locate the base line on the crt screen directly below the horizontal line etched with vertical marks on the crt graticule.

e. Set the DISPERSION switch to the HIGH position.

f. Rotate the DISPERSION control fully clockwise.

g. Rotate the VERT GAIN control to obtain approximately one-eighth inch of noise on the crt screen.

h. Rotate the MARKER AMPLITUDE control clockwise, beyond its OFF position.

i. Rotate the FREQUENCY DIFFERENCE MCS TUNING comtrol to line up the 0 mark (inscribed on the DIFFERENCE FREQ-MCS dial) directly below the index hair-line.

j. Rotate the CENTER FREQUENCY control to position the marker pip at the physical center of the crt screen.

k. Set the SYNC SELECTOR switch to the EXT position.

l. Set the SWEEP SPEED control to 8 .

m. Rotate the MARKER AMPLITUDE control to set the height of the marker pip at approximately three inches.

n. Refer to paragraph 1-10 for applicable tuning heads to cover the various frequency ranges from 10 through 40,000 mc.

o. Utilize the Model STU-1WA, STU-2WA, STU-3WA, or STU-5WA Tuning Head to cover the range of the signal under observation.

p. Rotate the TUNING control to locate the marker pip at the center of the spectrum lobe under observation.

q. Rotate the FREQUENCY DIFFERENCE MCS TUNING control so that the marker pip coincides with one edge of the spectrum lobe under observation.

r. Note the reading on the DIFFERENCE FREQ-MCS dial.

s. Rotate the FREQUENCY DIFFERENCE MCS TUNING control so that the marker pip coincides with the other edge of the spectrum lobe.

t. Note the reading on the DIFFERENCE FREQ-MCS dial.

u. Calculate the difference, in megacycles, between the readings obtained in steps r and s above. This figure is the width, in megacycles, of the particular lobe appearing in the crt display.

2-18. FINE FREQUENCY MEASUREMENT.

2-19. If more than one signal is to be examined on the crt screen, the internal marker circuit may be used to determine the frequency difference between the two signals. This marker circuit is independent of the TUNING control and may be used to "set" the position on the crt screen of one signal while tuning to the second. If the signals are close in frequency, and both are seen on the crt screen, the marker pip may be moved by means of the FREQUENCY DIFFERENCE MCS TUNING control. This control accurately determines small frequency

differences where the TUNING control is too coarse an adjustment. If two frequencies are very close together, as in multi-frequency transmitters, the frequency relationship can be carefully checked. The DISPERSION control and DISPERSION switch vary the dispersion of the display so that, at maximum dispersion, 80 mc appears across the crt screen and, at minimum dispersion, 60 kc are displayed. The minimum setting of the BANDWIDTH control makes it possible to use the TSA-W to its minimum resolution of 1 kc. Two signals can be thus distinguished if their frequency difference is 1 kc or more.

2-20. MEASURING FREQUENCY DRIFT.

2-21. The marker pip and the FREQUENCY DIFFERENCE MCS TUNING control provide a method to determine frequency drift of any piece of equipment operating within the tuning range of the TSA-W. Set the marker pip so that it coincides with the signal under observation at the beginning of the test. The position of the DIFFERENCE FREQ-MCS dial is noted. At the end of the test, if the drift of the signal has been small, the marker pip may be moved to the new position of the signal on the crt screen. The difference between the original and new readings of the DIFFERENCE FREQ-MCS dial equals the actual drift of the signal under test. Generally, the period drift is not of as much interest as "frequency pulling", due to tighter coupling or changing load conditions. Again, the same "before and after" procedure may be used with the FREQUENCY DIFFERENCE MCS TUNING control now serving to determine the exact degree of "frequency pulling".

2-22. CHECKING FOR CONTINUOUS TRANSMITTER OUTPUT.

2-23. The visual display of the TSA-W makes it useful in checking for "holes" in transmitter or signal generator operation. Often, using conventional test methods, low output or discontinuous operation over a small frequency range is not noticed. However, by tuning the equipment under test through its range, and tracking with the TUNING control on the TSA-W, the wide dispersion is used to permit careful examination of the entire spectrum.

2-24. REPRESENTATIVE SPECTRA.

2-25. Figure 2-6 illustrates various types of spectra that may be observed on the crt screen of the TSA-W. These types of "pictures" may be observed when checking the spectrum of pulsed magnetron oscillators. The display will indicate the pulse width, pulse shape, and the amount of amplitude or frequency modulation on the pulse. In this way, the TSA-W may be used to determine the extent and type of modulation present in what should be a cw signal or a pulsed signal. The data presented in figure 2-6 may be summarized as follows:

a. Amplitude modulation tends to change the position of the null points.

b. Frequency modulation tends to raise the null points.

c. A combination of amplitude and frequency modulation tends to distort the symmetry of the spectrum.

d. Having established the presence of distortion in the spectrum, measurements can be made to determine the nature of the modulating pulse. Side bands associated with amplitude and frequency modulated signals may be observed and measured. The relative power between side lobes and the main lobes may be determined with

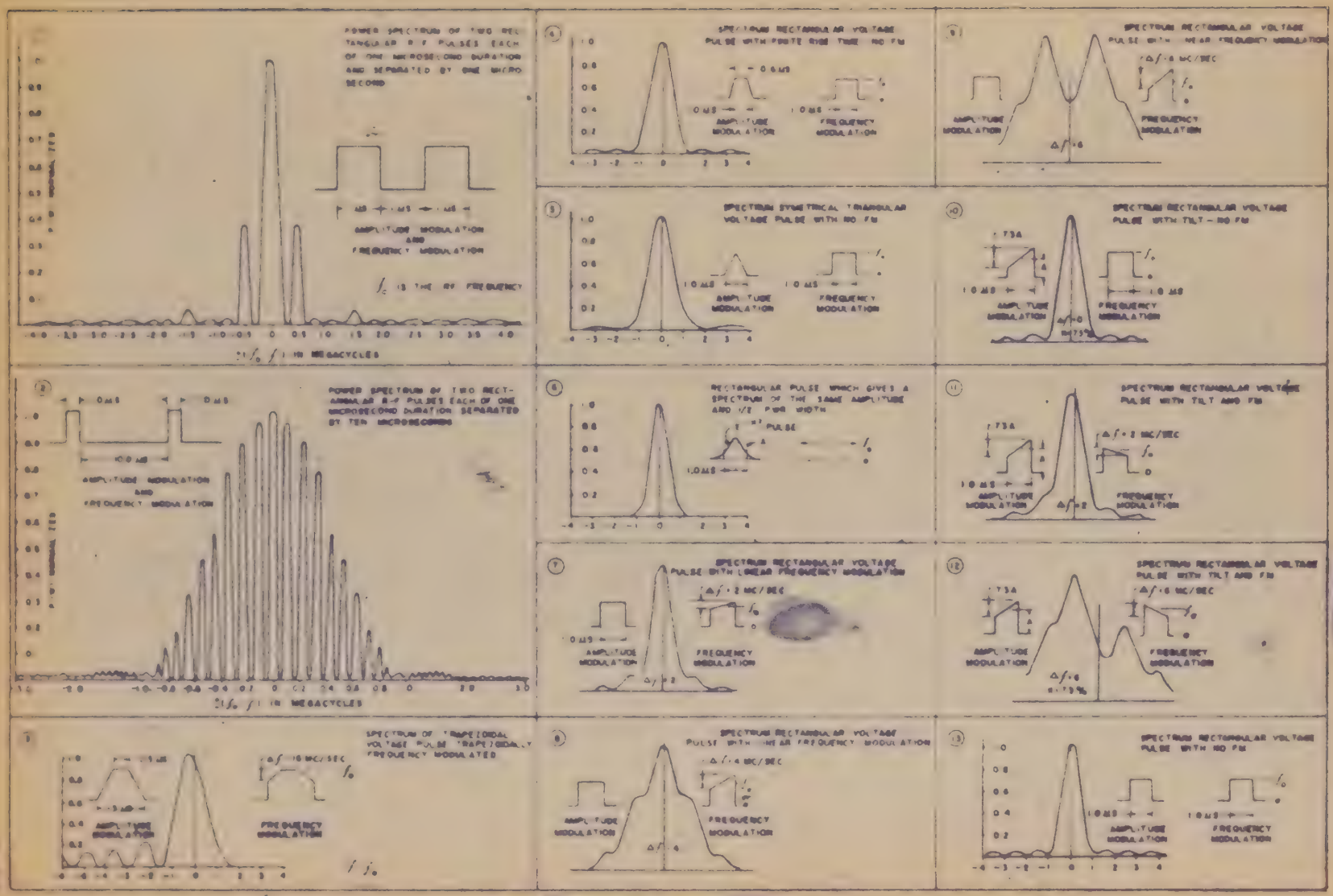

POWER SPECTRUM OF TWO RECTANGULAR R-F PULSES EACH OF ONE MICROSECOND DURATION AND SEPARATED BY ONE MICROSECOND
AMPLITUDE MODULATION AND FREQUENCY MODULATION
f_c IS THE RF FREQUENCY
$(f_c - f)$ IN MEGACYCLES
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH FINITE RISE TIME - NO FM
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH LINEAR FREQUENCY MODULATION
SPECTRUM SYMETRICAL TRIANGULAR VOLTAGE PULSE WITH NO FM
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH TILT - NO FM
POWER SPECTRUM OF TWO RECTANGULAR R-F PULSES EACH OF ONE MICROSECOND DURATION SEPARATED BY TEN MICROSECONDS
RECTANGULAR PULSE WHICH GIVES A SPECTRUM OF THE SAME AMPLITUDE AND 1/2 PWR WIDTH
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH TILT AND FM
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH LINEAR FREQUENCY MODULATION
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH TILT AND FM
SPECTRUM OF TRAPEZOIDAL VOLTAGE PULSE TRAPEZOIDALLY FREQUENCY MODULATED
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH LINEAR FREQUENCY MODULATION
SPECTRUM RECTANGULAR VOLTAGE PULSE WITH NO FM
AMPLITUDE MODULATION
FREQUENCY MODULATION

Figure 2-6. REPRESENTATIVE SPECTRA IN SIGNAL ANALYSIS

a calibrated r-f attenuator. Also, the half-power points of the main lobe can be determined with a calibrated r-f attenuator by noting the signal amplitude on the screen before and after 3-db of attenuation is inserted.

2-26. MEASURING INCIDENTAL FM OF AN APPLIED SIGNAL.

(See figure 2-7)

2-27. To measure the incidental fm of a signal, proceed as follows:

a. Apply the signal to the appropriate input jack of the TSA-W and adjust the front panel controls so that the main lobe appears on the crt screen.

b. Adjust the VERT GAIN control so that the main lobe occupies three-quarters of the crt display.

c. Use the FREQUENCY DIFFERENCE MCS TUNING control to calibrate the bandwidth from one edge of the crt graticule to the other. Divide this bandwidth figure by 10 to find the frequency change by graticule division.

d. Rotate the SWEEP SPEED control fully counterclockwise.

e. Draw two lines to indicate the pulse envelope (see lines A and B of figure 2-7). Draw a horizontal line (C) from one side of the envelope to the other. Drop two vertical lines (D and E) to the base line from the points on the inner and outer edges of the envelope crossed by the horizontal line (C).

f. Count the number of divisions between lines D and E at the base. Use the frequency change per scale division, obtained

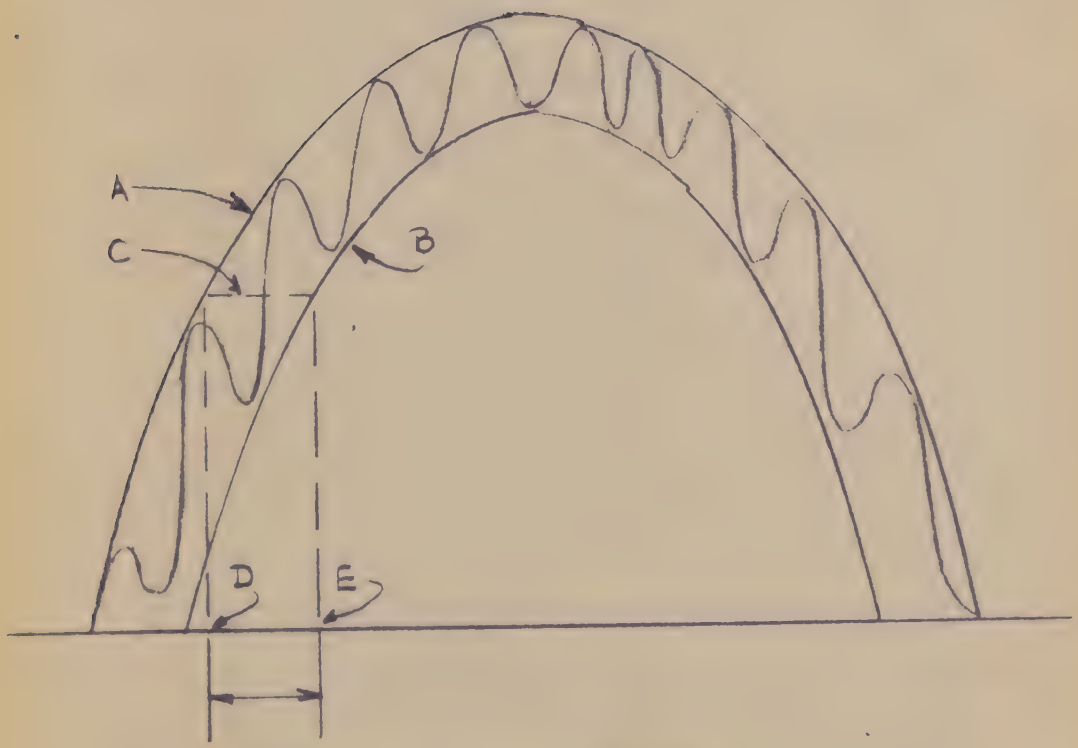


Figure 2-7. Technique for Measuring Incidental FM.

in step c above, to calculate the frequency change. This frequency change represents the incidental fm of both the applied signal and that inherent within the TSA-W.

g. Measure the inherent incidental fm of the TSA-W by using a stable r-f signal at the same frequency as the applied signal. Subtract this from the total frequency change calculated in step f. The above procedure determines the incidental FM measurement of the applied signal.

2-28. PROPER USE OF BANDWIDTH CONTROL.

Resolution, the ability to separate individual signals, is dependent upon both the rate of frequency sweep and the bandwidth of the i-f amplifier. When comparing two c-w signals separated by a small frequency difference, rotate the BANDWIDTH control in a counterclockwise direction until the two signals are completely separated. If the two signals are so close that the BANDWIDTH control cannot separate them, a beat signal will be observed on the cathode-ray tube screen. This may be virtually eliminated by turning the LOG-FILTER-LIN switch to the applicable FILTER position. This introduces a video filter designed expressly for the removal of beat signals. For optimum resolution of a single or of widely separated cw signals, the BANDWIDTH control should be rotated counterclockwise until the amplitude of the signal starts to decrease. The sensitivity of the spectrum analyzer is dependent upon the dispersion, i-f bandwidth and sweep speed.

2-29. When displaying a pulse spectrum, the sensitivity of the spectrum analyzer is dependent only upon the bandwidth. The sweep speed.should be adjusted so that approximately 50 prf lines appear in the main lobe and the first side lobe on either side of the main lobe. For optimum resolution of the pulse spectrum, the product of i-f bandwidth and pulse width must be less than 0.1. If the bandwidth is greater than this value, the minima of the spectrum is no longer zero. This loss of sensitivity due to bandwidth and pulse width reduces the dynamic range of the spectrum analyzer for pulse-modulated signals. See fig. 2-5.

2-30. PACKAGING INSTRUCTIONS.

2-31. PACKAGING FOR SHORT-TERM STORAGE. If the Model TSA-W is to be stored for a relatively short period, cover it with a suitable protective covering such as a sheet of plastic or paper. Put the accessories and instruction manual in a carton or bag and fasten it to the unit to prevent loss. Store the Model TSA-W in a clean dry area where it will not be subject to extreme temperature.

2-32. PACKAGING FOR LONG TERM STORAGE OR SHIPMENT.

(See figure 2-8)

2-33. If the Model TSA-W is to be stored for a long period of time,or shipped, proceed as follows:

a. If the original wrappings and carton have been saved, use them to package the equipment as shown in figure 2-8.

b. If new packing materials are to be used, assemble the necessary wrappings and carton.

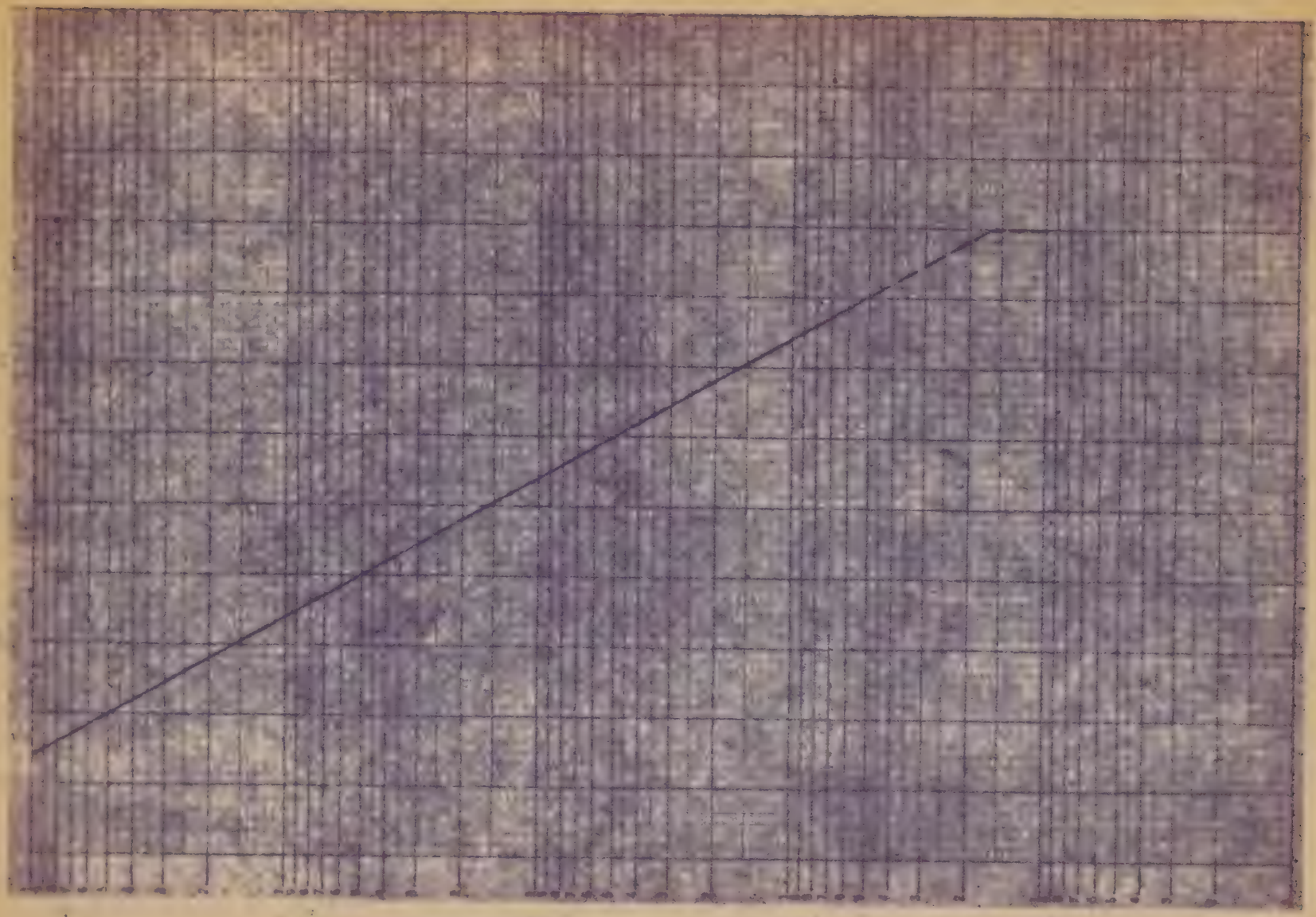


Figure 2-5. Sensitivity Loss as a Function of Signal Pulse Width and Bandwidth

c. Wrap the equipment in a moisture and vapor-proof barrier such as plastic or waterproof paper.

d. Wrap the accessories and instruction manual in a moisture and vapor-proof barrier.

e. Place the package in a suitable carton. Fill all empty spaces in the carton with suitable packing to prevent shifting of the packages within the carton.

f. Seal and mark the carton.

g. If the storage or shipping conditions make it necessary enclose the carton within an outer carton or wooden box.

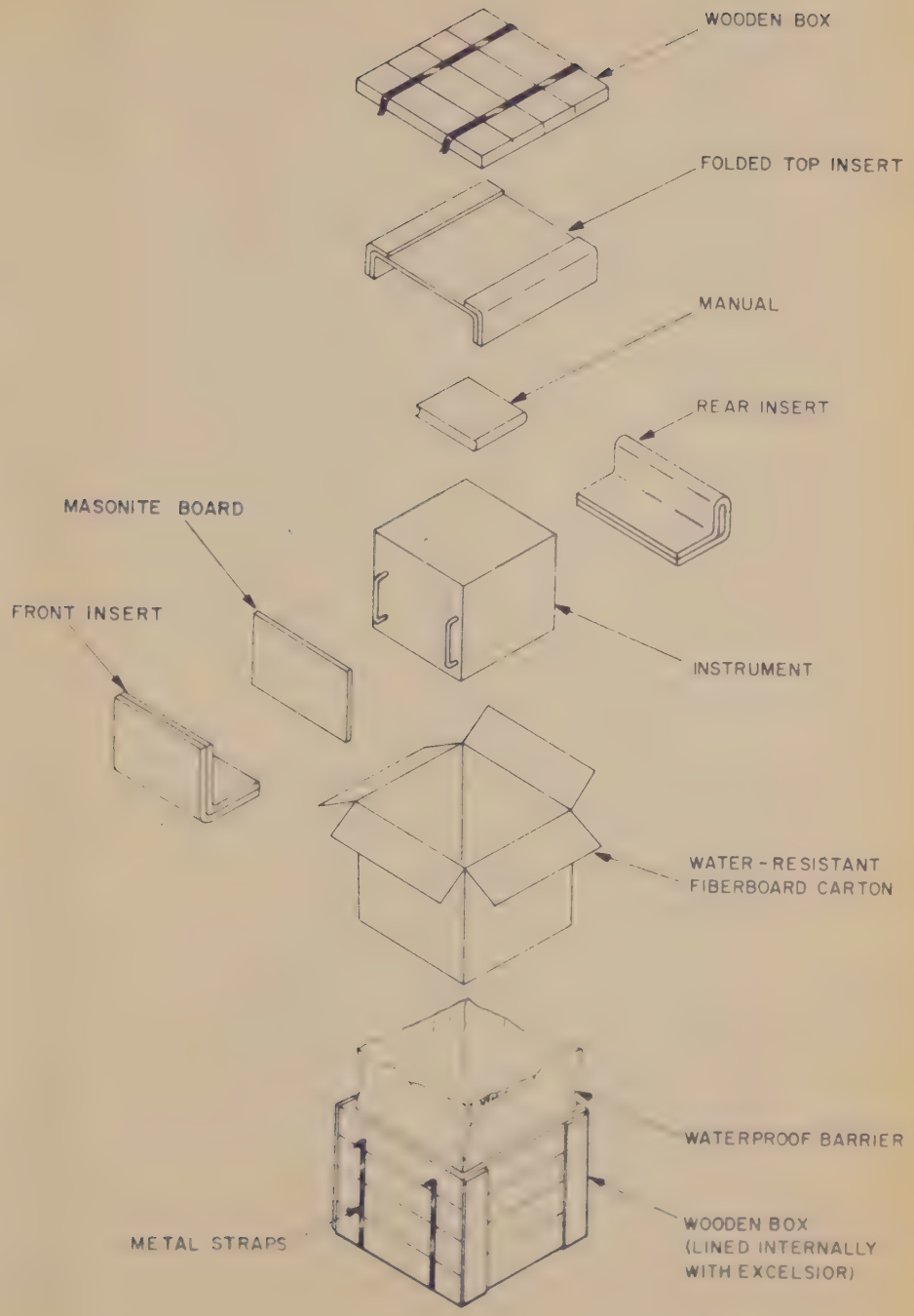


Figure 2-8. Packaging Diagram

ALL CAPACITANCES ARE EXPRESSED IN MICRO MICROFARADS (UUF) UNLESS MARKED OTHERWISE AND ARE 500 VOLTS UNLESS SUFFICED BY UF FOR MICROFARAD, MF FOR MILLIHENRY H FOR HENRY K FOR KILOHM, M MEG FOR MEGOHM

CAPACITORS ARE RATED AT 10%, 600 VDCW UNLESS OTHERWISE INDICATED

ELECTROLYTICS ARE RATED AT +200% -10% 1000 VDC TEST UNLESS OTHERWISE INDICATED

RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED

▭ INDICATES EQUIPMENT PANEL MARKING

INDICATES SCREWDRIVER ADJUSTMENT

FRA W 635-N2 UF

R-F MC OUTPUT OF RF TUNING UNIT

W90

I-F AMPLIFIER
V701
6922

I-F AMPLIFIER
V702
6922

I-F AMPLIFIER
V703
6922

I-F AMPLIFIER
V704
6922

WIDE-BAND I-F AMPLIFIER

MARKER AMPLITUDE

VERNIER

COARSE

MARKER OSCILLATOR

MARKER OSCILLATOR

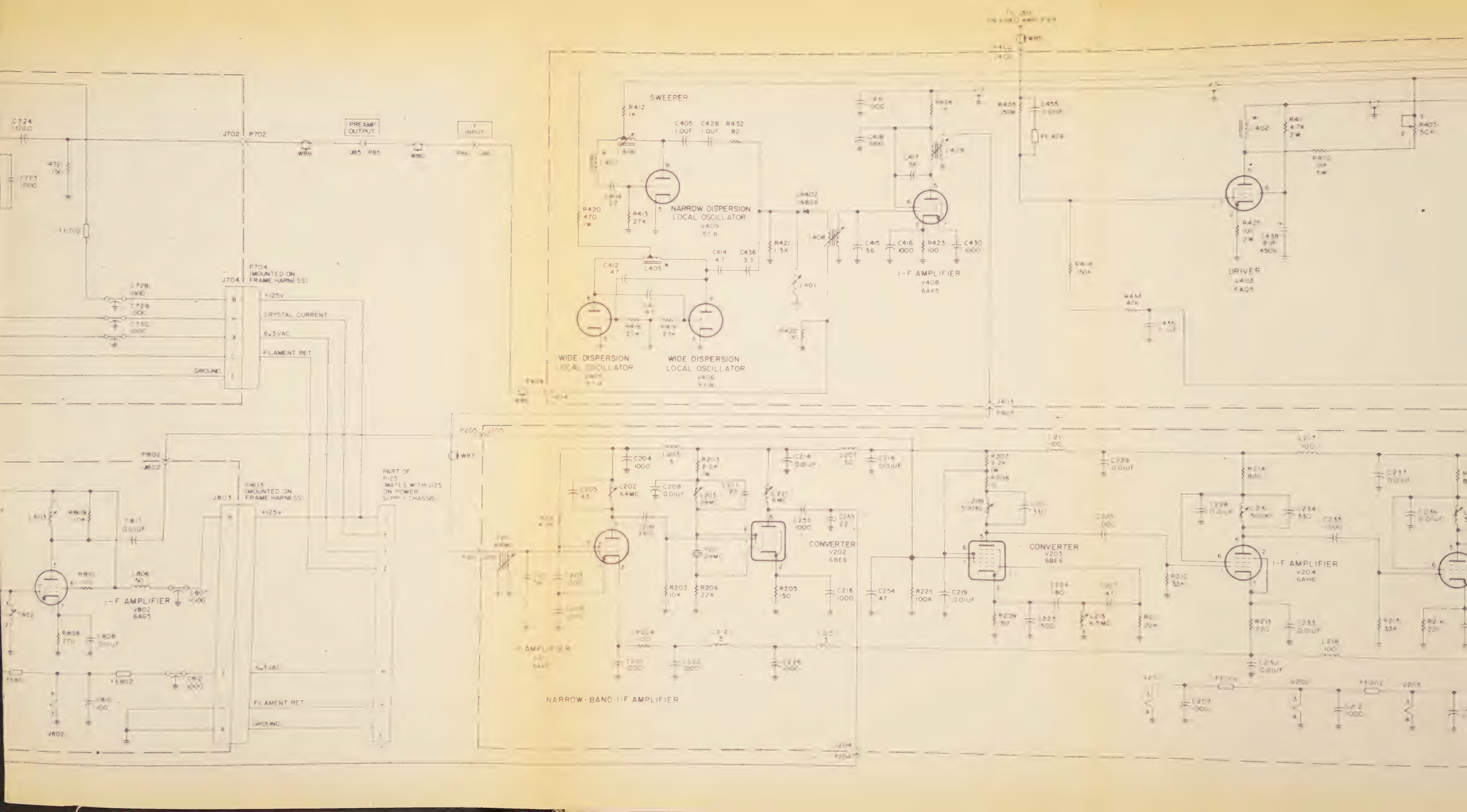
FROM MIXER ON FRAME HARNESS

BANDWIDTH

I-F AMPLIFIER
801A
1/2 12AT7

I-F AMPLIFIER
801B
1/2 12AT7

VARIABLE BANDWIDTH I-F CONTROL AMPLIFIER


SWEEPER
NARROW DISPERSION LOCAL OSCILLATOR V409 6T8
WIDE DISPERSION LOCAL OSCILLATOR V405 6T8
WIDE DISPERSION LOCAL OSCILLATOR V406 6T8
I-F AMPLIFIER V408 6AK5
DRIVER V403 6AQ5
I-F AMPLIFIER V802 6AG5
CONVERTER V202 6BE6
CONVERTER V203 6BE6
I-F AMPLIFIER V204 6AH6
NARROW-BAND I-F AMPLIFIER
PREAMP OUTPUT
IF INPUT
P704 (MOUNTED ON FRAME HARNESS)
J704
+125v
CRYSTAL CURRENT
6.3VAC
FILAMENT RET
GROUND
P802
J802
P803 (MOUNTED ON FRAME HARNESS)
J803
PART OF P-25 MATES WITH J125 ON POWER SUPPLY CHASSIS
P205
J205
W87
J702
P702
W85
J85
P85
W86
W84

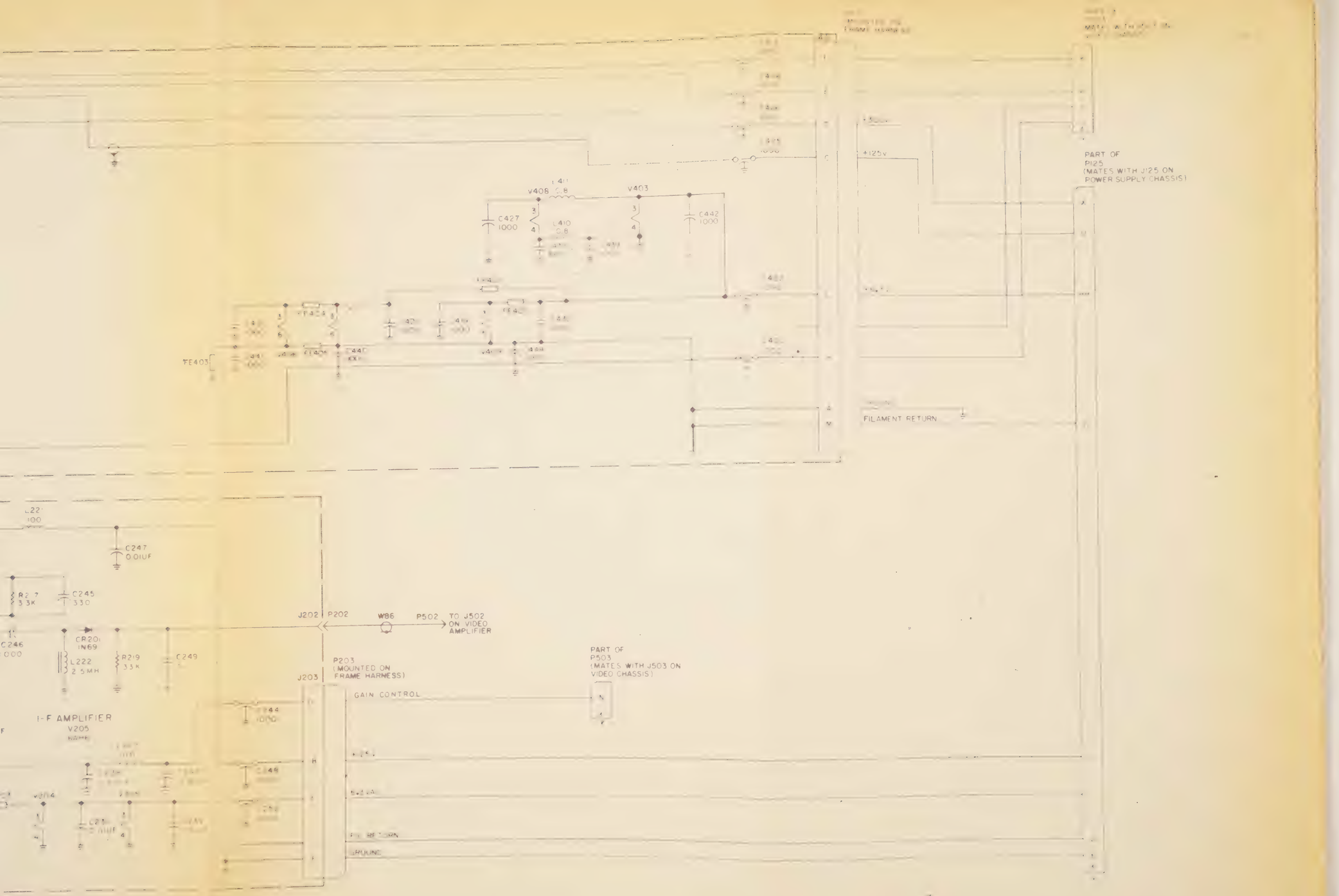


Figure 5-1. Model TSA-W Display Unit, Schematic Diagram

MATES WITH J501 ON VIDEO AMPLIFIER CHASSIS

VIDEO AMPLIFIER CHASSIS

CATHODE FOLLOWER
V502
12AT7

PHANTASTRON
V501
6AS6

BLANKING MULTIVIBRATOR
V503
12AU7

BLANKING AND INTENSIFIER AMPLIFIER
V504
12AU7

HORIZONTAL AMPLIFIER
V505
12AU7

+125V
+300V
-150V
-50V

R501 12K
R502 470K
R503 120K
R504 3,9MEG
R505A 1MEG
SWEEP SPEED
R505B 25K
R506 100
R507 33K
R508 50K
H ZERO
R509 56K
R511 50K
VIDEO ZERO
R513 1MEG
TO V502
R514 270K
R515 25K
BLANK WIDTH
R516 18K
R517 10K 2W
R518 47K
R519 22K
R521 680K
R522 22K 2W
R523 120K
R524 12K
R525 10K
R526 68K 2W
R527 68K 2W
R528A 50K
HOR POS
R528B 1MEG
HOR GAIN
R529 100K
R532 100K
R533 270K
R534 50K
R535 68K
R536 1MEG WIDE DISP
R537 2,5MEG NARROW DISP
R538 100K DISPERSION
R539 47K
R543 120K
R588 4,7K
R589 1MEG INTFR
R596 470K
R597 100K

C501 1000
C502 0,1UF
C503 0,022UF
C504 0,005UF
C505 0,005UF
C506 1UF
C507 0,01UF
C508 0,1UF

CR501 N69
CR508 IN198

K501

V501 V502 V503 V504 V505 V506 V507 V508 V509

J501

STU-1W RELAY
STU-1W RELAY
115VAC
+300V
WIDE DISPERSION OSCILLATOR
CENTER FREQUENCY
SHIELD
VERT GAIN

NOTE ALL VALUES ARE EXPRESSED IN MICRO MICROFARADS (UUF), MICROHENRIES (UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM, OR MEG FOR MEGOHM

CAPACITORS ARE RATED AT ±10%, 400 VDCW, UNLESS OTHERWISE INDICATED

INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED

RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED

▭ INDICATES EQUIPMENT PANEL MARKING

⊘ INDICATES SCREWDRIVER ADJUSTMENT

SERIAL NOS. 595 & UP

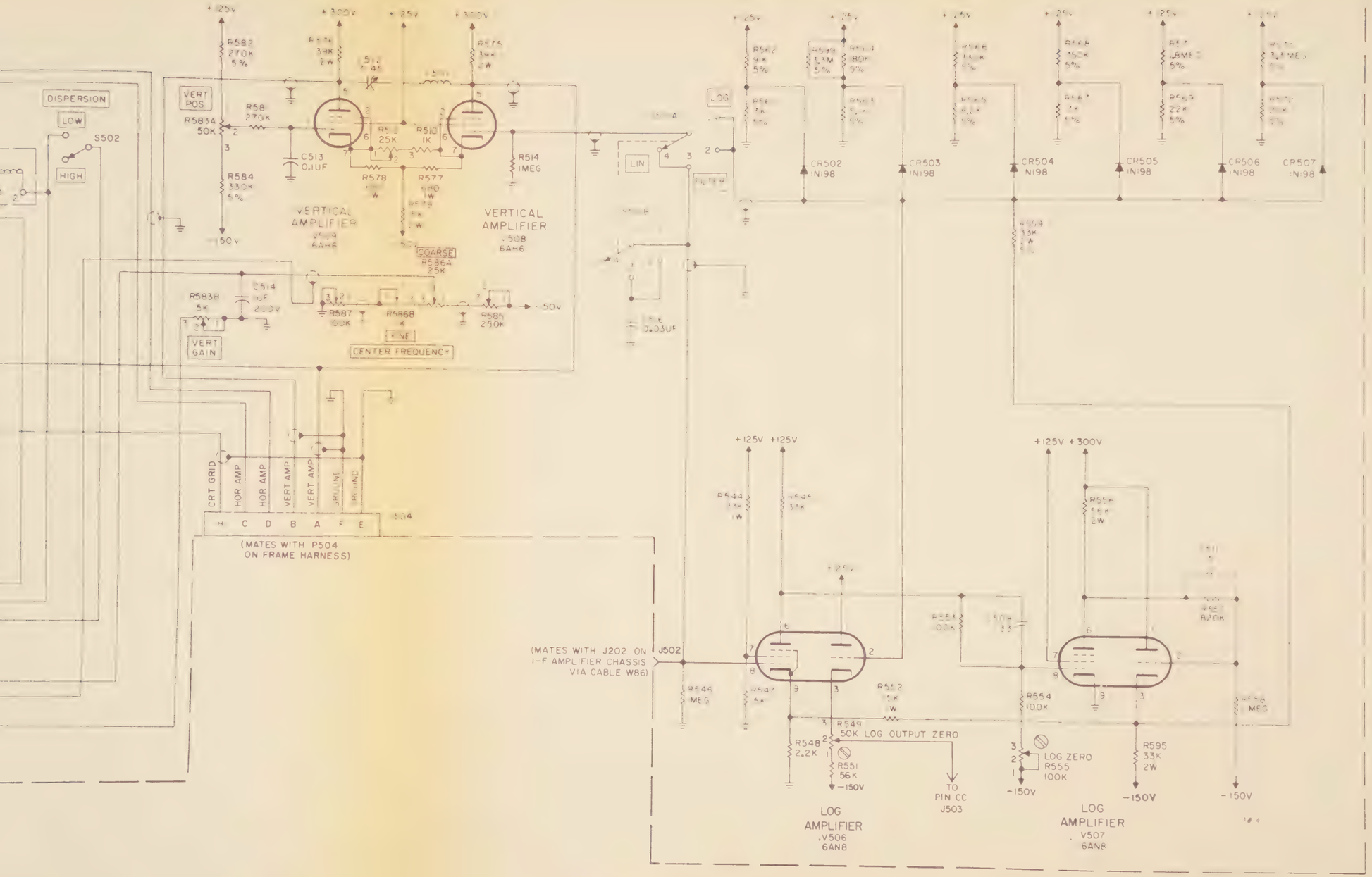
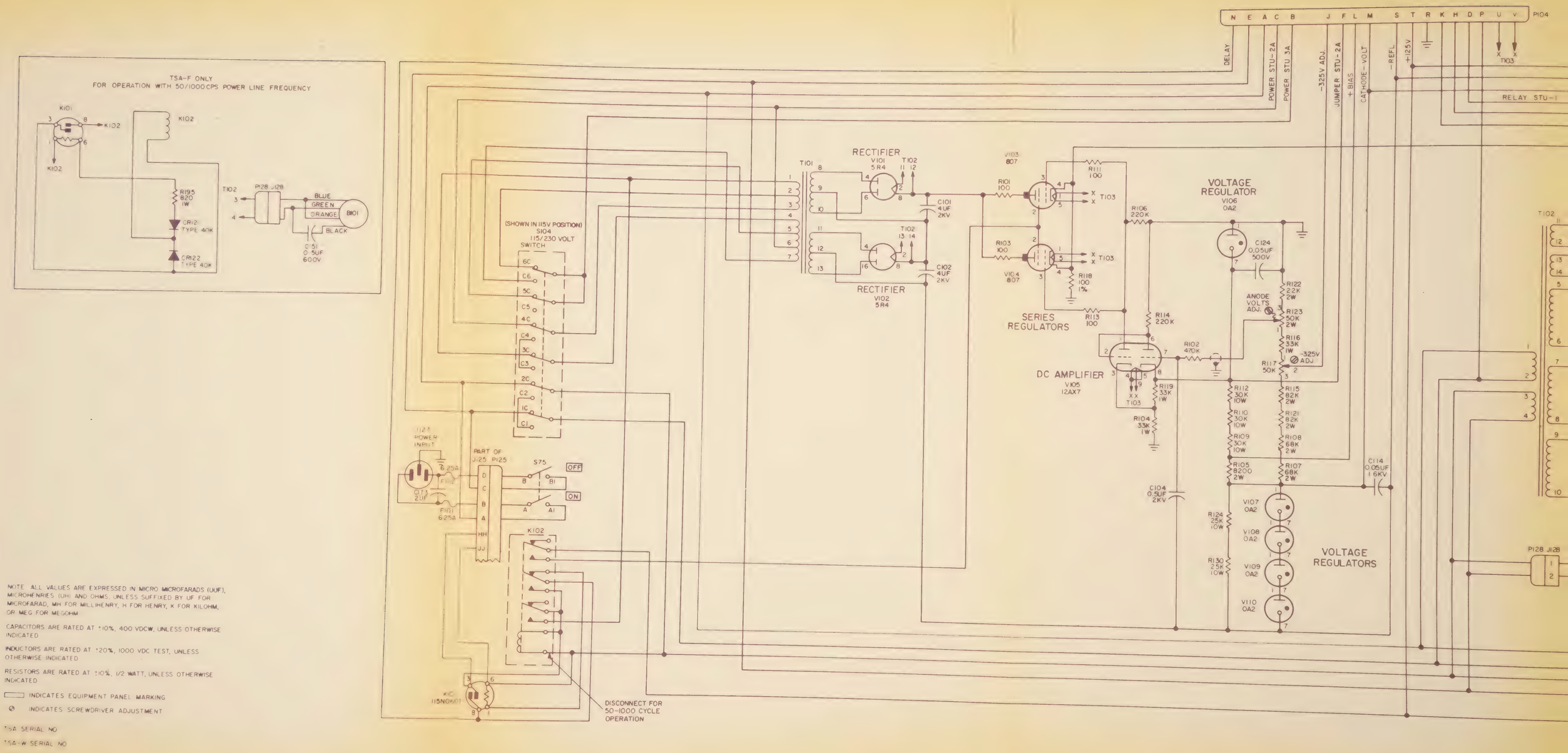


Figure 5-2. Model TSA-W Video Chassis, Schematic Diagram



NOTE ALL VALUES ARE EXPRESSED IN MICRO MICROFARADS (UUF), MICROHENRIES (UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM, OR MEG FOR MEGOHM

CAPACITORS ARE RATED AT ±10%, 400 VDCW, UNLESS OTHERWISE INDICATED

INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED

RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED

▭ INDICATES EQUIPMENT PANEL MARKING

Ø INDICATES SCREWDRIVER ADJUSTMENT

TSA SERIAL NO

TSA-W SERIAL NO

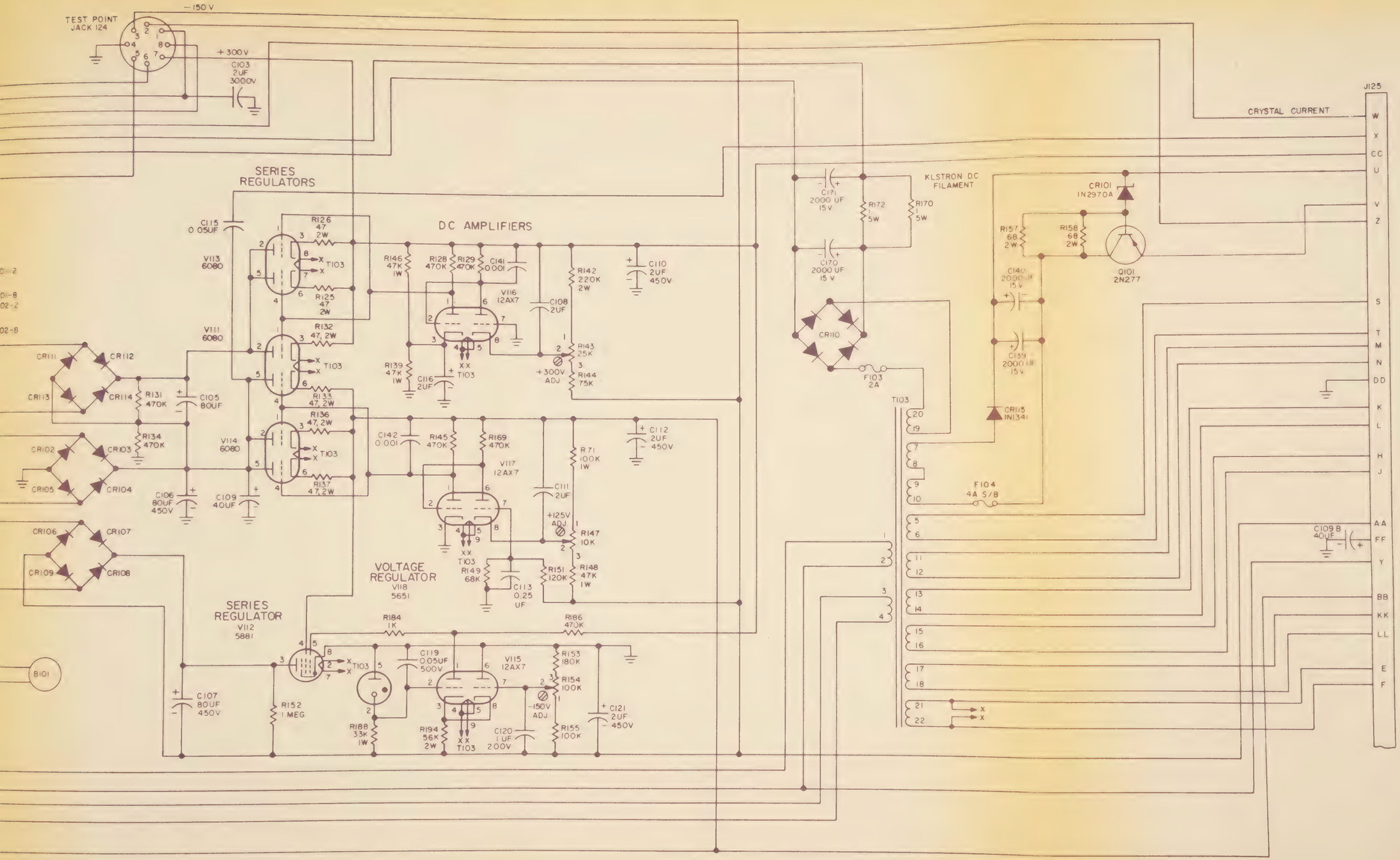
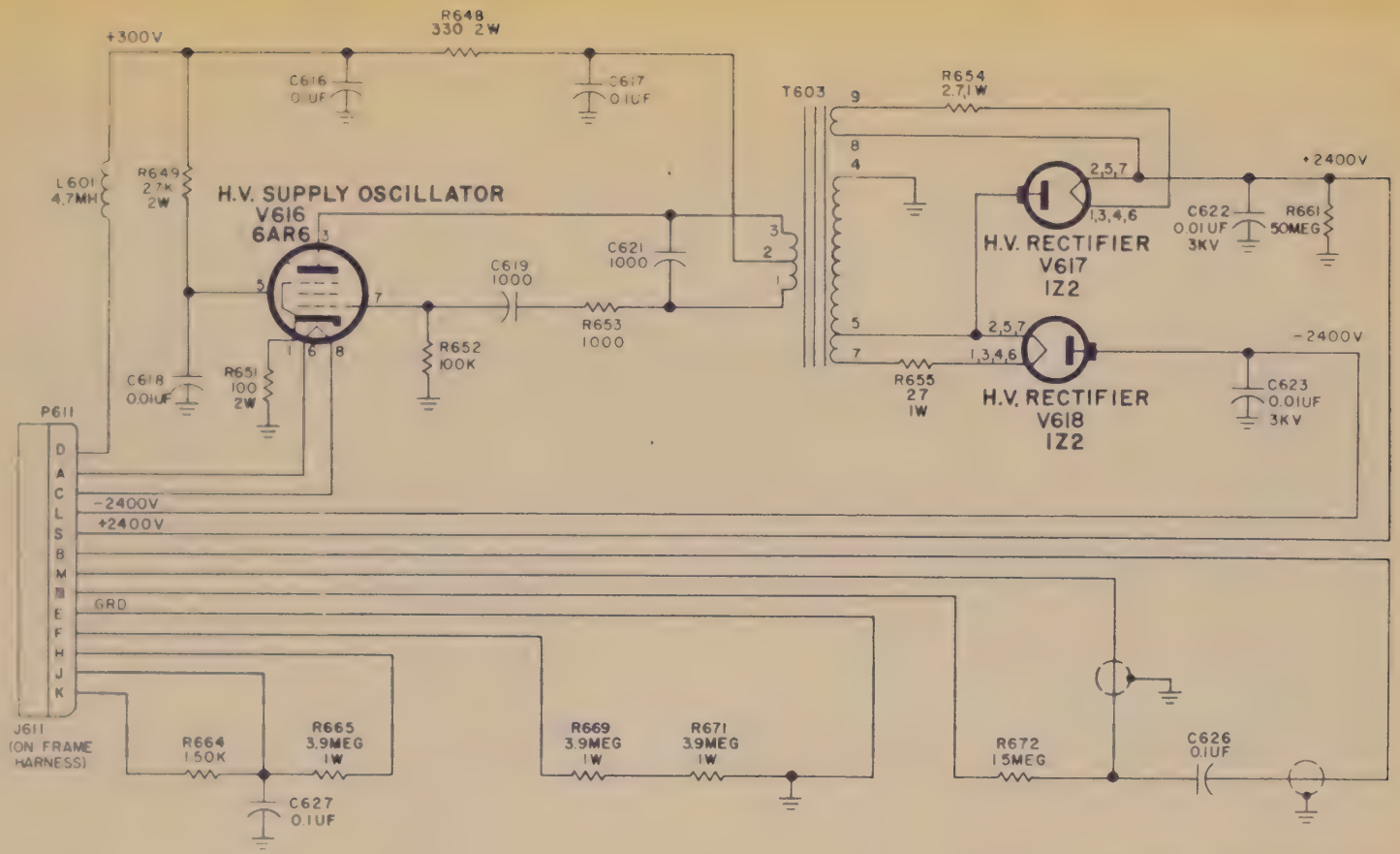


Figure 5-3. Model TSA-W Klystron and Low Voltage Power Supply, Schematic Diagram



NOTE ALL VALUES ARE EXPRESSED IN MICRO MICROFARADS (UUF), MICROHENRIES (UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM, OR MEG FOR MEGOHM

CAPACITORS ARE RATED AT ±10%, 400 VDCW, UNLESS OTHERWISE INDICATED

INDUCTORS ARE RATED AT ±20%, 1000 VDC TEST, UNLESS OTHERWISE INDICATED

RESISTORS ARE RATED AT ±10%, 1/2 WATT, UNLESS OTHERWISE INDICATED

▭ INDICATES EQUIPMENT PANEL MARKING

⊘ INDICATES SCREWDRIVER ADJUSTMENT

8130 SERIAL NO 126 AND UP
8100 SERIAL NO 1250 THRU 1359

Figure 5-4. Model TSA-W CRT Power Supply, Schematic Diagram

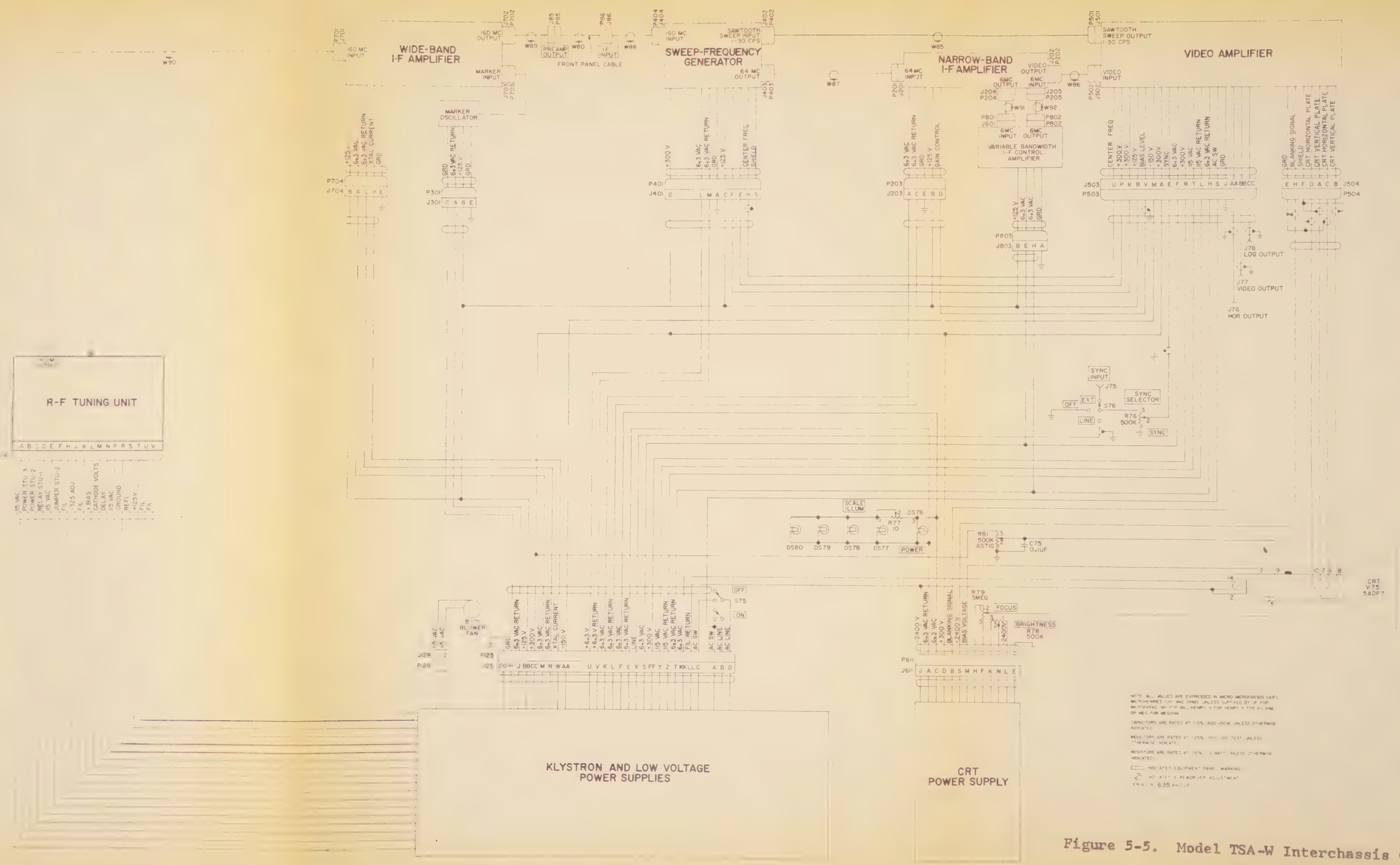


Figure 5-5. Model TSA-W Interchassis Cabling Diagram

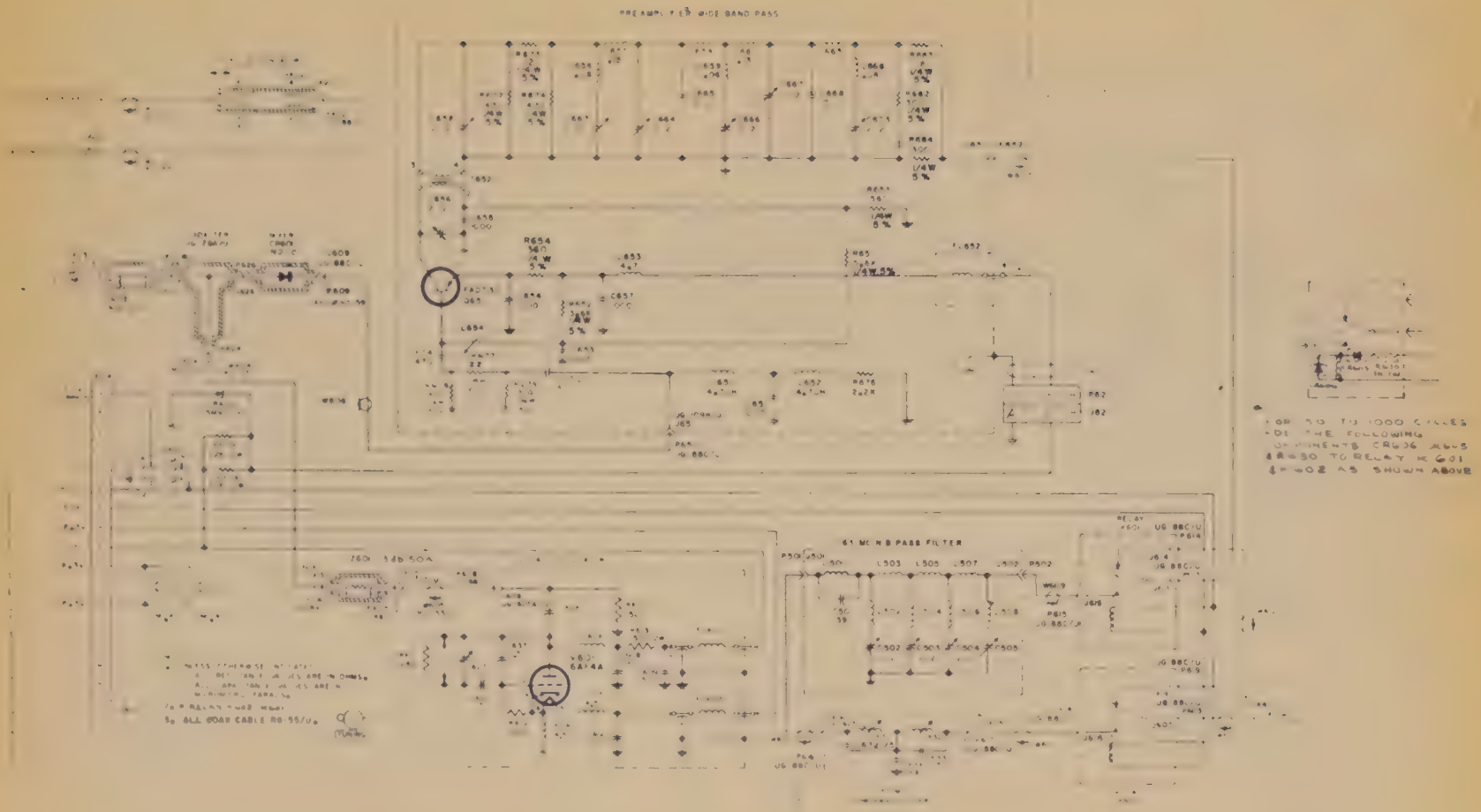


Figure 5-6. Tuning Unit Model STU-1WA, Schematic Diagram.

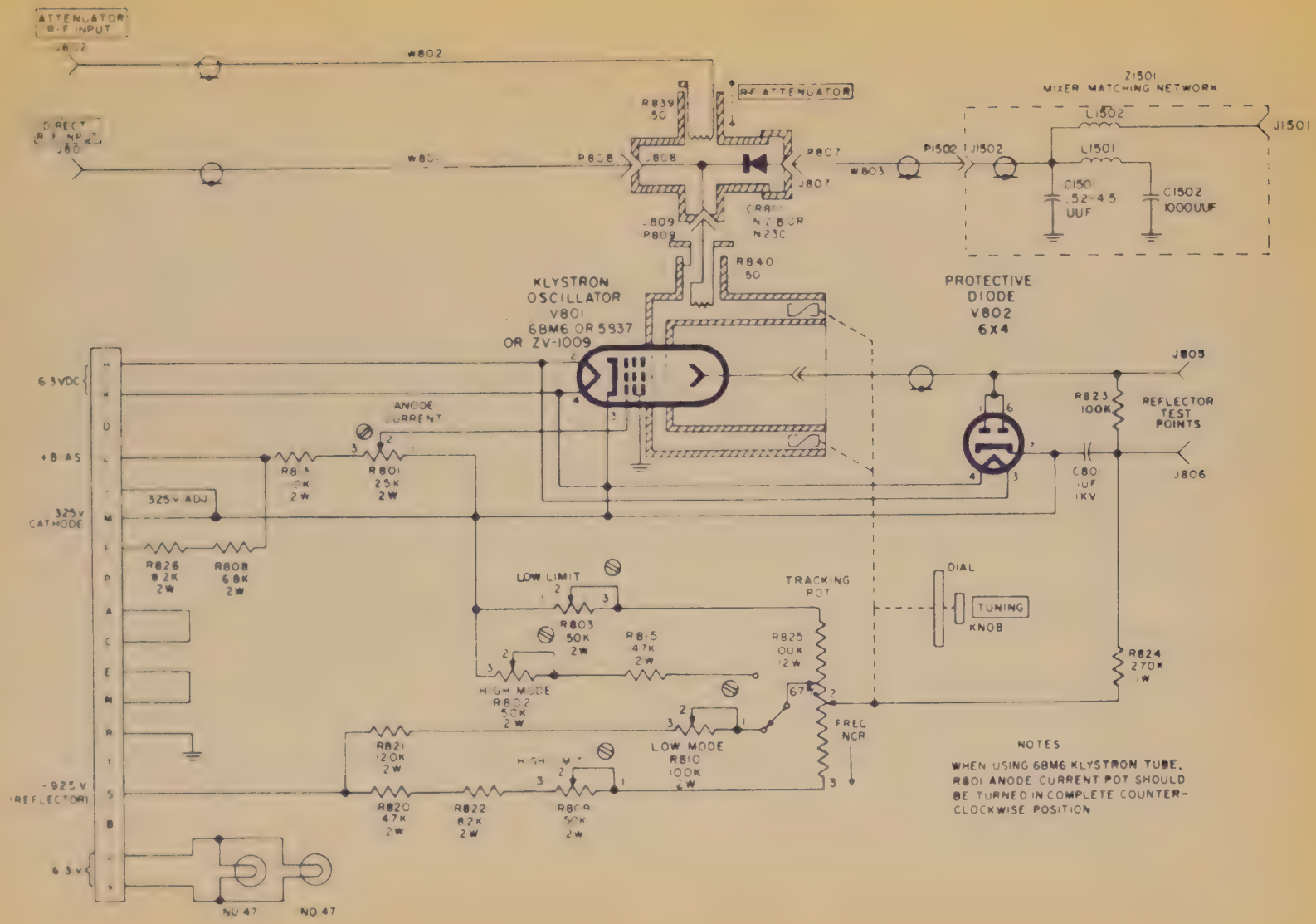


Figure 5-7. Tuning Unit Model STU-2WA, Schematic Diagram.

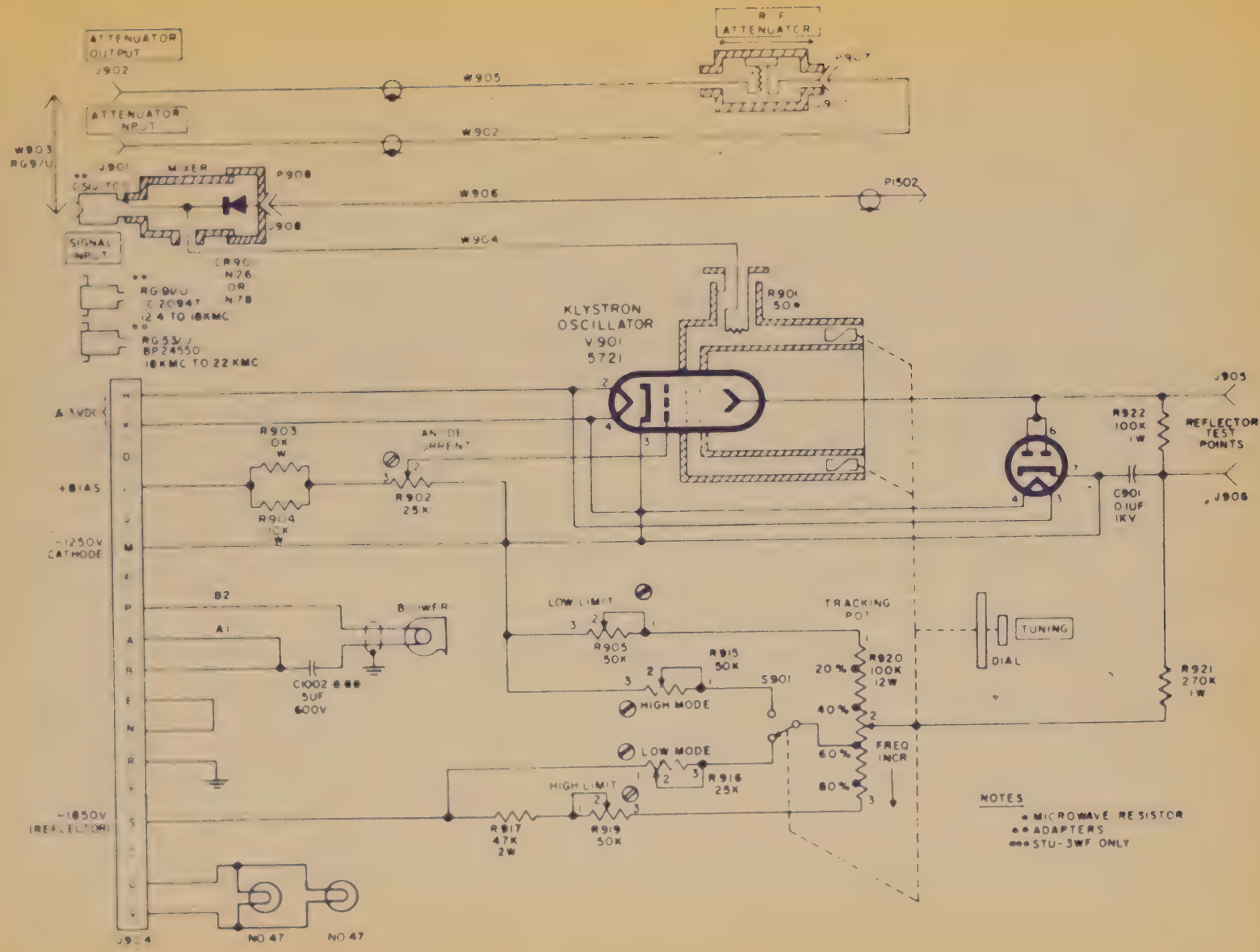


Figure 5-8. Tuning Unit Model STU-3WA, Schematic Diagram.

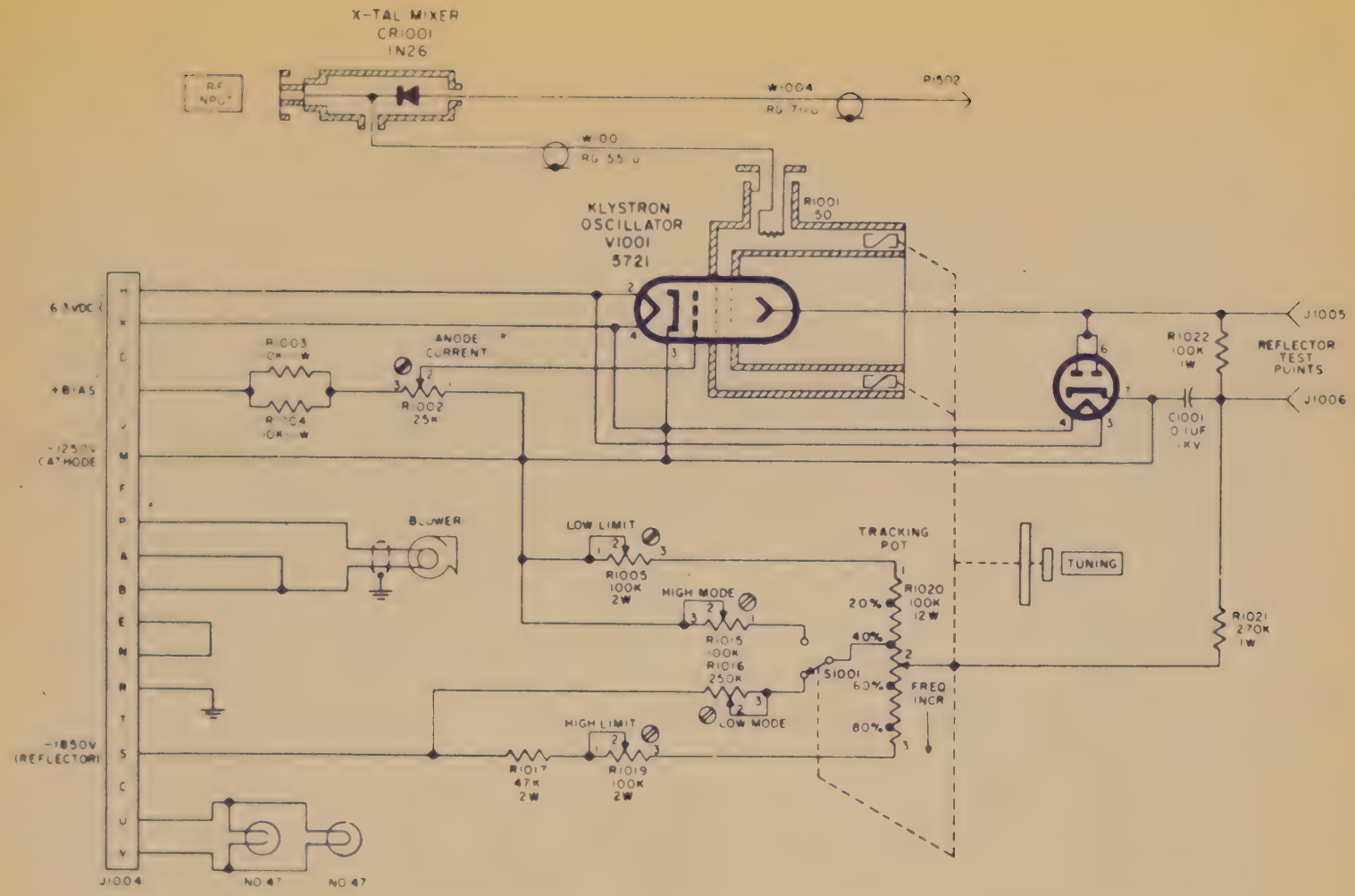


Figure 5-9. Tuning Unit Model STU-4WA, Shcematic Diagram.

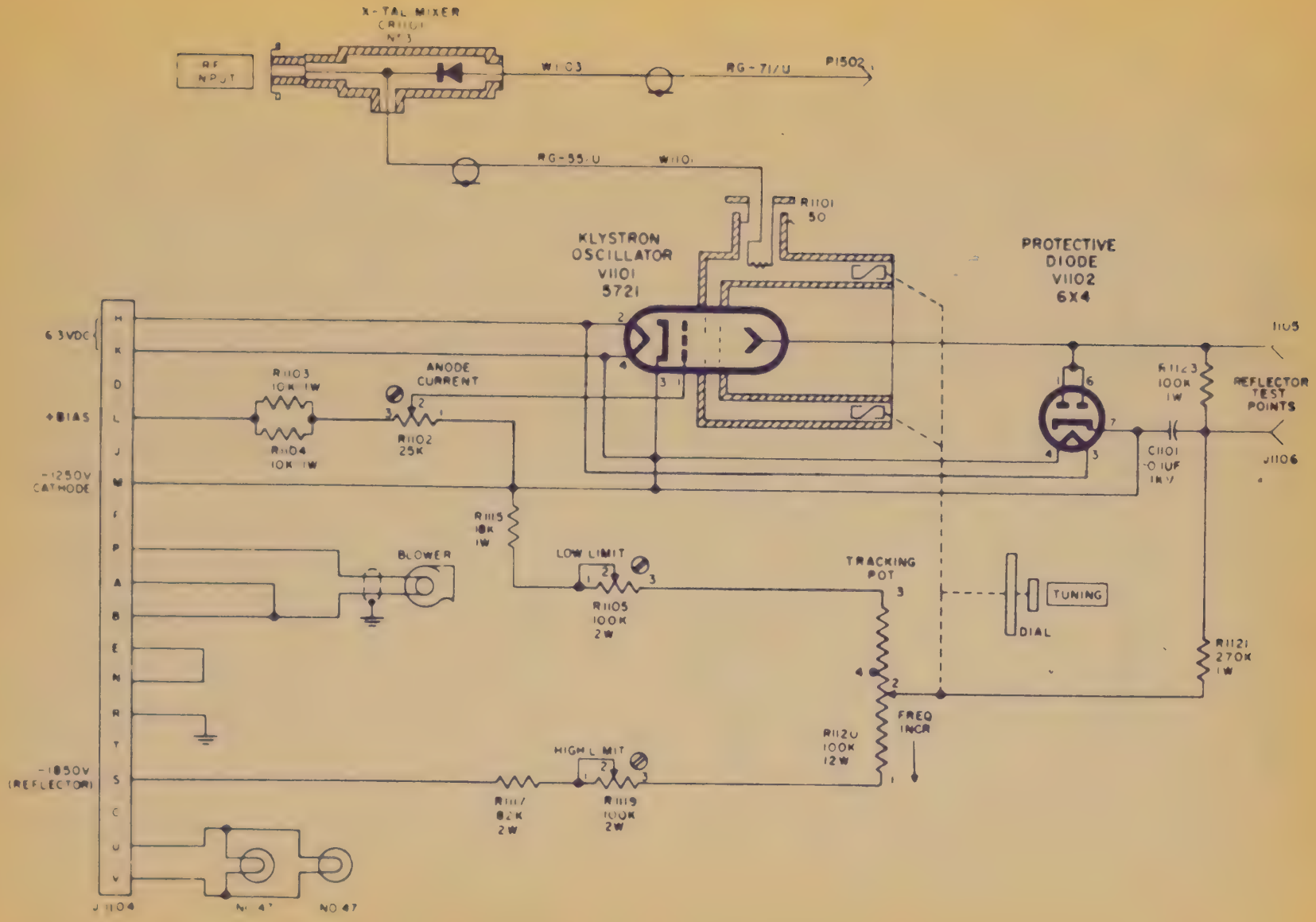


Figure 5-10. Tuning Unit Model STU-5WA, Schematic Diagram.

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CONSULTANTS — DESIGNERS — MANUFACTURERS

43-20 34th Street Long Island City 1, N. Y.

EXeter 2-4500

REQUEST FOR MAINTENANCE

FROM:

COMPANY NAME _____ DATE: _____

ADDRESS: _____ INDIVIDUAL _____

_____ POSITION _____

SECTION OR DIVISION _____ PHONE NO. _____ EXT. _____

EQUIPMENT _____ DATE OF PURCHASE _____

MODEL _____ SERIAL NO. _____ ORDER NO. _____

TROUBLE REPORT:

A. Description of trouble _____

_____

_____

_____

_____

_____

B. Has trouble been localized? _____ If so, how and where: _____

_____

_____

_____

_____

_____

C. Instruments used and measurements taken, if any: _____

_____

_____

_____

D. Is trouble intermittent? _____

E. Hours of operation prior to this trouble _____

F. Date trouble occurred _____

G. Was factory consulted by telephone or letter prior to this request? _____

If so, give date and person to whom directed: _____

_____

H. Additional Comments: _____

_____

_____

_____

_____

_____

_____

When trouble develops requiring factory assistance, complete this form and send to:

Polarad Electronics Corporation
43-20 34th Street
Long Island City 1, New York
ATTENTION: Service Department

After this report has been analyzed by the Service Department, you will be notified when a field service engineer will call on you to make the necessary repairs. If your trouble can best be corrected at the factory, we will so notify you with instructions and authorization for returning the equipment.

NO EQUIPMENT MAY BE RETURNED TO THE FACTORY WITHOUT WRITTEN AUTHORIZATION

POLARAD PROVEN RELIABILITY

POLARAD ELECTRONICS CORPORATION

43-20 34th Street
Long Island City 1, New York

World Leader in Microwave Instrumentation

SPECTRUM ANALYZERS—10-100,000 MC

Undisputed leader in the field of microwave spectrum analysis, Polarad offers the widest, most diversified line of equipments for precise and meaningful quantitative and qualitative evaluation of any signal, regardless of complexity or frequency content. The features listed below are generally common to all Polarad Spectrum Analyzers:

- Direct-reading UNIDIAL® tuning —no klystron mode-setting!
- Frequency Dial Accuracy, ±1%
- Sweep-rate adjustable, 1-30 cps
- Non-contacting klystron-cavity chokes for noiseless tuning, optimum stability
- Five-inch flat-face CRT display
- Compatible with Multi-pulse Spectrum Selector SD-1

Model TSA-S
Dual-Purpose Spectrum Analyzer/ Synchroscope

TSA SERIES. 10-44,000 MC in 5 plug-in tuning units. Model TSA provides power vs. freq. display (A), below. Model TSA-S provides both (A) and synchroscope display (B). Wide-dispersion Model TSA-W provides (A) display, up to 80 MC (full screen), down to 60 KC for wide pulse analysis, as in (C).

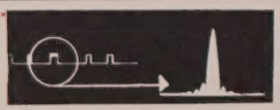
MODEL	DISPERSION	RESOLUTION	MARKER	NOTES
TSA	25 KC-25 MC	1-80 KC	±14 MC	Sensitivity —50 to —100 dbm
TSA-S	400 KC-25 MC	5/50/500 KC and 5 MC	±14 MC	Sensitivity —50 to —100 dbm. Synch. Sweep Rates: 2 μsec to 0.1 sec/cm
TSA-W	25 KC-80 MC	1-80 KC	±40 MC	Sensitivity —50 to —100 dbm Displays spectra of 0.1 μsec pulses

Model SA-84W
Wide-Band Spectrum Analyzer

SA SERIES Universal Spectrum Analyzers provide complete coverage from 10-40,880 MC in compact, self-contained form. The new lightweight transistorized unit Model SA-84T is truly portable, and will operate from either the AC line or 12 V DC. The SA-84W wide-band design features exceptionally broad frequency coverage and very wide dispersion in a single-unit package.

Model SA-84T
Transistorized Portable

MODEL	DESCRIPTION	DISPERSION	RESOLUTION	NOTES
SA-84T	Transistorized Universal	400 KC-25 MC adjustable	20 KC	Internal Marker, ±13 MC Sensitivity, —50 to —105 dbm.
SA-84	Standard Universal	500 KC- 5 MC (up to 55 MC) 500 KC-25 MC (above 55 MC) adj.	20 KC	Variable Internal Marker comparable sensitivity to SA-84T
SA-84W	Wide-Dispersion Universal	25 KC-10 MC 25 KC-80 MC 240 to 40,880 MC	1-80 KC variable	Crystal-controlled markers over entire freq. range. Log-linear display. Accurate IF attenuator. Comparable sensitivity to SA-84T



MULTI-PULSE SPECTRUM SELECTOR: When used with any Polarad Spectrum Analyzer, this instrument permits isolation and spectrum analysis of any individual pulse in a complex coded signal.

Model SD-1

MODEL DA-70, 50-100 KMC Spectrum Analyzer. Dispersion adj. 50-1000 MC. Resolution 1 MC. High IF assures image rejection, prevents video detection. Sensitivity, —50 dbm, nom. Frequency marker for ΔF measurements.

MODEL WSA Wide-Band Spectrum Analyzer. 10-40,000 MC in 20 push-button-selected bands. Narrow mode: 1-25 MC dispersion, 20 KC resolution. Wide mode: 50-4,000 MC dispersion, 1.5 MC resolution. Freq. marker to 4 KMC. End-markers indicate band limits. Center-marker for wide-to-narrow switching without signal loss.

Model WSA

USE THIS CARD for complete specifications or call your local Polarad representative (see the Yellow Pages).

SIGNAL GENERATORS—0.5-50 KMC

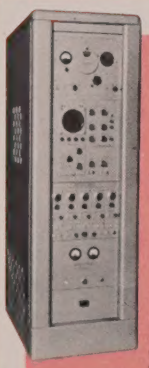
Model PMR
UHF Signal Generator

MSG-2R
Signal Generator

Model MSG-34
Ultra-Broadband Signal Generator

500-11,000 MC SERIES. These superb instruments incorporate every important mechanical and electronic advancement known to the art, including several Polarad exclusives, such as UNIDIAL® tuning. Direct-reading frequency dials, accurate to ±1%. High-stability non-contacting klystron-cavity shorts for noiseless tuning, permanent accuracy. Continuously-variable, directly-calibrated attenuators. Modulation: internal pulse, FM, sq-wave; external pulse and multi-pulse. Delayed and undelayed sync. outputs. The Model PMR provides exceptional FM capability through the use of a special plug-in modulator (supplied).

MODEL	FREQUENCY-KMC	CALIBRATED POWER OUTPUT	INTERNAL MODULATION
PMR	0.5 - 1.0	0.5 MW (—3 dbm) to —127 dbm	sq-wave, 40-4,000 pps } FM with plug-in Pulse, 10-10,000 pps } modulator
KSS (Signal Source)	1.05-11.0 (4 plug-ins)	Uncalibrated. Power Output: 14-400 MW, depending on freq.	sq-wave, 10-10,000 pps (external pulse, sq-wave, FM)
PMX	4.45-11.0 (2 plug-ins)	1 MW (0 dbm) to —127 dbm	All instruments in this group: pulse modulation: 10-10,000 pps. *pulse width: 0.2-10 μsec. pulse delay: 2-2,000 μsec. square-wave modulation: 10-10,000 pps. FM deviation: ±2.5 MC min. *0.3-10 μsec. in MSG-1R and 2R.
MSG-34 (Ultra Broadband)	4.2 -11.0 digital freq. indicator	1 MW (0 dbm) to —127 dbm	
MSG-1R	0.95- 2.40	1 MW (0 dbm) to —127 dbm	
MSG-2R	2.0 - 4.60	1 MW (0 dbm) to —127 dbm	



MULTI-PULSE CODE-MODULATED MICROWAVE SIGNAL GENERATOR

Model B — 0.95 to 10.75 KMC 4 plug-in tuning units. 5 independent adjustable channels, each with variable pulse width and delay. Built-in precision scope.

EHF SERIES Signal Generators (frequency and power calibrated) and Signal Sources (frequency calibrated) operate CW, with 1 KC int. modulation, or ext. mod'n. See chart for tuning unit ranges and designations. Also available: SG-1218 Generator or SS-1218 Source, 12.4-17.5 KMC.

EHF Series
Signal Generators

EHF SIGNAL GENERATOR Tuning Unit	Frequency Range	EHF SIGNAL SOURCE Tuning Unit
G1822-1	18,000 to 22,000 mc	S1822-1
G2225-1	22,000 to 25,000 mc	S2225-1
G2427-1	24,700 to 27,500 mc	S2427-1
G2730-1	27,270 to 30,000 mc	S2730-1
G3033-1	29,700 to 33,520 mc	S2933-1
G3336-1	33,520 to 36,250 mc	S3336-1
G3540-1	35,100 to 39,700 mc	S3540-1
	39,600 to 46,000 mc	S4046-1
	45,900 to 50,000 mc	S4650-1

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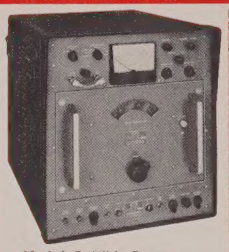
World Leader in Microwave Instrumentation

MICROWAVE RECEIVERS & FIELD INTENSITY METERS, 0.4—84.2 KMC

Polarad, pioneer in microwave receiver development, offers the industry's most complete and diversified line of precisely-calibrated, wide-range receivers and radio-interference-and-field-intensity(RI/FI)meters. The new transistorized portables feature built-in inverters for optional 12 VDC operation. **Only Polarad** offers **both** calibration techniques: Integral signal generator (Model FIM-2) for wide-range, absolute level calibration **or** (Model CFI) integral impulse generator for simplicity, convenience. All units have audio, video, and recorder outputs. All display output directly in db.

Model CFI Portable Transistorized Calibrated RI/FI — Meter/Receiver



Model R Wide-Range Multipurpose Microwave Receiver

Model FIM-2 Absolute-Calibrated RI/FI—Meter/Receiver

Model TR Transistorized Portable Wide-Range Multipurpose Receiver

Both the CFI and FIM-2 have Category A Air-Force Approval Per MIL-I-26600 and MIL-I-6181

MODEL	DESCRIPTION	FREQUENCY RANGE	MINIMUM SENSITIVITY ⑥	SELECTIVITY & TUNING (see notes below)	CHARACTERISTICS
CFI	TRANSISTORIZED CALIBRATED RI/FI METER/RECEIVER (Category A AF approved)	1-10 KMC (0.95-11.26 as receiver)	—90 to —84 dbm	① ② ③ ④	• **Digital** frequency dial • AM, FM, CW, Pulse reception • AFC, AGC (60 db linearity range!)
FIM-2	CALIBRATED RI/FI METER/RECEIVER (Category A AF approved)	1-10 KMC Check Polarad for 21 KMC Coverage.	—81 dbm	① ② ③ ④	• Single UNIDIAL® tunes both receiver and signal generator. • First system to determine radiated RF interference and susceptibility.
TR	TRANSISTORIZED MICROWAVE RECEIVER	0.95-11.26 KMC	—90 dbm	① ③ ④ ⑤	• AFC, AGC circuits. • **Digital** frequency dial • AFC, AGC (60 db linearity range!)
R	ULTRA-WIDE-BAND MICROWAVE RECEIVER	0.4-84.2 KMC	—85 to —50 dbm	② ③ ⑤	• UNIDIAL® direct-reading freq. control • AFC, AGC (60 db linearity range!)

Calibrated antenna system includes both omni (broad-band) and directionals for each range.
Attenuation: 0-80 db in 1 db steps
Front panel metering of average, peak, slide-back peak, or quasi-peak RF level.

These versatile precision devices are really **four instruments in one:**
- AM, FM, CW, MCW, Pulse Receiver.
- Field-intensity receiver.
- Pulse, pulse-time position demodulator.
- Sensitive power meter.

① Impulse Bandwidth: 1, 5, or 8 mc (Model FIM-2, 5MC only).
② Image and Spurious Response Rejection: better than 60 db. (up to 11.26 KMC in Model R)
③ Four plug-in tuning units cover entire range (Model R uses 9) and all are direct-reading, calibrated to ±1%.
④ Maximum RF input, 3 Volts.
⑤ Video bandwidth: 3.5 MC (Model TR) 2 MC (Model R)
⑥ Depending upon frequency.

ANTENNA PATTERN TUNING UNIT 2-75 KMC: Used with Model R receiver. External Mixer with flexible cable. Locate up to 75 ft. from receiver, at or near antenna. Internal 1 KC sweep — compatible with all standard AC recorders.

Model RW-T

CALIBRATED ANTENNAS
1,000 to 10,000 MC

TEST ANTENNAS
1,000 to 40,000 MC

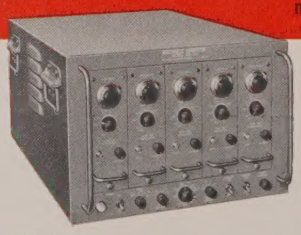
TRANSISTORIZED IMPULSE GENERATOR Model IC-120: 1 MC-10 KMC. Calibrates microwave receivers for RI/FI work. Signal source for spectrum analyzers. Generates 0.02 nanosec. pulses.

ALL-CERAMIC REFLEX KLYSTRONS Maximum resistance to shock, vibration, temperature extremes. Guaranteed operation to 250°C, without cooling. Stable, low noise, low microphonics. (X series has guaranteed minimum 200 mw output.) Request complete application data.

TYPE	FREQ. RANGE—KMC	RETMA
ZV1012	0.5 - 3.0	7506
ZV1010	0.7 - 3.0	7505
ZV1010X	0.95- 2.8	——
ZV1021	1.0 - 4.0	——
ZV1021X	1.0 - 4.0	——
ZV1009	1.5 - 6.0	7049
ZV1009X	1.7 - 5.0	——
ZV1011	4.0 -11.0	8052

SPECIAL INSTRUMENTATION for MICROWAVE DEVELOPMENT, PRODUCTION, CHECKOUT.

Condensed listing of precision instruments developed by Polarad to meet a wide range of requirements.



Model MP-1A
Five-Channel Coded Multipulse Generator

CODED MULTI-PULSE GENERATOR. Model MP-1A. Five independently adjustable channels generate coded multipulse trains. Permits independent external PTM of each channel. 10-10,000 cps group rep-rate, each pulse adj. 0.2-2 μsec. Delay, 0-300 μsec.

PULSE JITTER TESTER. Model PJ-1. Measures and displays magnitude and waveform of:
Relative jitter: 5/10/100 nanosec. full scale
Pulse-width jitter: 5/10/100 nanosec. full scale
Rep-rate jitter: 5/10/100 nanosec, 1/10/100 μsec. full scale

MICROWAVE TUBE TESTER. Model K-200. Simple as conventional tube tester, monitors cathode, anode, grid, reflector voltages and currents, checks shorts, fil. continuity. Tests klystrons (internal/external-cavity) pencil triodes, rocket and lighthouse tubes.

PRECISION NOISE GENERATOR. Model N-1. 1KC-500MC source for direct measurement of noise figure (1-20 db, accurate to ±0.25 db) of VT and transistor circuits.

TRANSISTORIZED MICROWAVE POWER METER. Model P-3. Measures absolute power instantly, directly, 10-40,000 MC with 5 interchangeable thermistor mounts. 0.01 MW full scale sensitivity! Line or battery operated, only 6 lbs.

BG-678

I would like more information and specifications on: (circle)

SPECTRUM ANALYZERS
TSA SA-84 DA-70
TSA-S SA-84T WSA
TSA-W SA-84W SD-1

SIGNAL GENERATORS
PMR MSG-1R EHF
MSG-34 MSG-2R KSS
PMX B

RECEIVERS and RI/FI METERS
R RW-T CFI
TR FIM-2 IC-120
ANTENNAS

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PJ-1 P-3 MP-1A
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Measurement Engineering Ltd.
P.O. Box 1352
Station O
Montreal, Quebec, Canada
National 7-4313

Mel Sales Ltd.
71 Crockford Blvd.
Scarborough, Toronto

Mel Sales Ltd.
Arnprior, Ontario
Canada

OVERSEAS REPRESENTATIVES

ARGENTINA

Tecnitron
Charcas 1337
Buenos Aires

AUSTRALIA

Electronic Industries
Imports Pty Ltd.
139/143 Bouverie St.
Carlton, N. 3, Melbourne

AUSTRIA

INGLOMARK
Markowitsch & Co.
Mariahilfer Str 133
Vienna XV

BENELUX
I.R.C.A.
Paradysstraat 92
Voorburg, Holland

BRAZIL

Emile H. Staub, S.A.
Caixa Postal 4612
Sao Paulo

CHILE

Fred Muller, SAC.
Casilla Coreo 3844
Santiago

CHINA

Heighton Scientific Co.,Ltd.
49, South Yen-Ping Road
Taipei, Taiwan

DENMARK

Ditz Schweitzer
Bredgade 37
Copenhagen

ENGLAND

B & K Laboratories Co., Ltd.
4, Tilney Street, Park Lane
London W. 1

FINLAND

Orbis O/y
P.O. Box 16015
Helsinki — Toolo

FRANCE

Bureau de Liaison
113 Rue de L'Universite
Paris 7c

GERMANY

Rohde & Schwarz Vertriebs GMbH
Zweigniederlassung
Hohe Strasse 160-168
Koln

GREECE

Ev. D. Devletoglou
44 Eleftheriou Venizelou
Athens

ICELAND

Elding Trading Company
Hasnarhvoli
Reykjavik

INDIA

Motwane Pvt. Ltd.
P.O. Box 1312
Bombay 1

INDONESIA

Bah Bolon Trading Co., NW
Djalan Linggawa St. 16
Bandung

ISRAEL

Electronic Equipment
6, Ibn Gvirol
Tel-Aviv

ITALY

Bay & Co., S.P.A.
Via Fabio Filzi N. 24
Milano (506)

JAPAN
Marubun Co., Ltd.
No. 1, 2-Chome
Odenmacho, Nihonbashi
Chuo-Ku, Tokyo

KOREA

Chung Do Industrial Co., Ltd.
P.O. Box No. 1451 International
Seoul

MEXICO

Representaciones Electronics
de Mexico
Av. Coyoacan 745-16
Mexico, D. F.

NETHERLANDS

I.R.C.A.
Paradysstraat 92
Voorburg, Holland

NEW ZEALAND
W & K McLean, Ltd.
7 Anzac Avenue
Auckland

NORWAY

P. N. Biorn
Tellbodgt 4
Oslo

PERU

V. M. LaPierre & Cia.
Los Alamos 375
San Isidro, Lima

PHILIPPINES

Radio Electronic Headquarters, Inc.
P.O. Box 1400
Manila

PORTUGAL

Equipamentos de
Laboratoria, Lda.
Apartado 458
Lisbon

SOUTH AFRICA

Leigh & Hurwitz (Pty) Ltd.
P.O. Box 3236
Johannesburg

SWEDEN

Gunnar Petterson
Ostmarksgatan 31
Stockholm-Farsta

SWITZERLAND

Omni Ray AG
Dufourstr 56
Zurich 8

VENEZUELA

Venelectronica
Apartado 10827
Sabena Grande
Caracas

Manufacturers of Microwave & Electronic Equipment